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MAN'S PREHISTORIC PAST



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Vedda men in the primeval forest, offering homage to their head man. A study in primitive Society. Taken in the interior of Ceylon by Skeen, Photographer, of Columbo. Mr. Skeen has made a series of photographic studies of the Vedda people, to accomplish which he found it necessary to live in the Vedda country for months, and gain the personal friendship of a small band of this extremely sensitive and suspicious people. This is one of this series, reproduced here by special permission.

MAN'S PREHISTORIC PAST

BY

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NORTHAMPTON, MASS.

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To My Friend and Teacher
JOHN MASON TYLER
Under the Spell of Whose Inspiration
I Have Passed Many an Hour
In the Old Days at Amherst
And Whose Instruction, thus Pleasantly Imparted,
Has Bountifully Enriched My Maturer Years.

P R E F A C E

At the present time, when general interest is directed to the events of the distant past, when the daily press teems with accounts of excavations, and with speculations concerning the relative age of the remains found, when sketches of early life in caves is used on the film for comparison with modern scenes, or to explain modern relationships, and when from the modern pulpit we are instructed with regard to prehistoric man, there is grave danger lest we get confused in our chronologies. Moreover, since at the same time there is keen popular interest in certain extinct animals vastly more ancient than any type of Man, all of which latter at the earliest lie within the events of the Ice Ages, the danger is imminent of confusing our time values and considering our immediate ancestors as contemporaries of the Dinosaurs. There is thus the greatest need of a chronological record of events, beginning with the time of creatures that first show the slightest human attributes, placed in orderly sequence and divided into successive periods, up to the time at which Man began to record his own history, an actual *Outline of Prehistory*.

After treating of the general subject of Prehistory, and the methods of reading these unwritten annals, obtained through excavation, the actual series of events are considered, as they have occurred in the different

continents, the aim being to consider the entire subject as far as it is yet known, and thus to furnish a foundation upon which to begin our recorded history.

It is my pleasant task in completing this Preface to thank my many colleagues who by their advice and encouragement have assisted me in my work, and in this I wish especially to mention the Staff of the American Museum of Natural History. In manuscript form the present book was first sent to Dr. Henry Fairfield Osborn, and after him in turn it passed through the hands of others of the Staff, receiving especial attention from Dr. Nils C. Nelson, who eventually sent me many pages of detailed criticism, which was of the greatest assistance to me in my final revision. His criticisms are referred to in several places in the book, with his initials. I wish also to express my especial thanks to Dr. Clark Wissler and Dr. Louis Sullivan, who have also reviewed parts of my manuscript.

HARRIS HAWTHORNE WILDER.

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Man's Prehistoric Past

CHAPTER I

THE CHRONOLOGY OF PREHISTORY

Prehistory vs. History—The Relation of Geology to Prehistory—Sketch of Tertiary Times—The Great Ice Age—Glacial Action, and Its Results—Chronology of the Ice Age—Post-glacial Times—The Work of the Post-glacial Rivers and Lakes—River Terraces—Eolian Deposits; Loess.

1. *Prehistory vs. History.*—The philosopher, to whatever race or nation of men he may belong, cannot progress very far into the past without finding the traditions concerning the origin of his people unsatisfying. Differing among themselves as these traditions may, they all show the well-known characteristics of folklore; they make preposterous claims of divine progenitors; they violate the most elementary natural laws in the events they describe. In one group of these stories the first men dwelt beneath the ground in a subterranean cave-world, and reached the surface by climbing up the roots of a great tree; in another, men are moulded out of dirt or clay by the fingers of a superhuman artificer, or are transformed from animals by an impossible sort of metamorphosis. There is always an extraordinary lack of time prospective, and all the events from the creation to the beginning of history are crowded into a few hundred years at the most. This time is filled up with fabulous

events, among which appear, drawn to an heroic size, certain characters whose existence as actual men is almost entirely submerged in a sea of legend.

A history like this fills in, for most peoples, the entire period of human existence from the beginning, and it was thus in a moment of insight far beyond even the academic position of his day that Horace exclaimed :

*“Vixere fortis ante Agamemnona
Multi; sed omnes illacrimabiles
Urgentur ignotique longa
Nocte, carent quia vate sacro.”¹*

The *vatis sacer* of the Roman poet, a compound of priest, minstrel and improvisator, was of course the historian, and the thought was that the oblivion of the long past was due, not to any lack of noteworthy and valorous deeds, but solely because the means had been wanting for permanently recording these events.

It is thus the art of writing, with its power of accurately and permanently recording the details of events, that separates *History* from *Prehistory*, and sets the boundary between the two at neither a definite date, nor at a definite stage of material culture. Primitive peoples like the Polynesians, or the North American Indians, can readily learn to read and write, and an entire tribe may become literate in a single generation ; while, on the other hand, the excavations of recent years have revealed many extensive civilizations, which have attained culture in their art and architecture, and refinement in their mode of living, and have yet never developed anything but the

¹ Many brave men have lived before Agamemnon but, all unwept for and unknown, are overwhelmed in the long night (of oblivion) because they lack the sacred bard.

erudest means of recording thought by written inscriptions. They have thus remained "*ignoti et illacrimabiles*" until the buried vestiges of their civilization have been uncovered by the spade of the archeologist.

One of the first uses to which writing has been put, when introduced into a tribe, is to record its body of tradition, long transmitted orally, and held in the memory of the learned men, and these, by the addition of the more recent records, form a document which passes gradually from an impossible and marvelous past into contemporaneous and matter-of-fact history.

In a history constructed in this way it is inevitable that the traditional part should be full of marvels, while, aside from an occasional exaggeration favorable to the nation of the narrator, the contemporary part should be quite possible. The Song of Pentaur, inscribed on the walls of the Ramesseum at Thebes, is a document contemporary with the events it chronicles, and, except for certain diplomatic exaggerations may be taken as literal history; the Iliad and Odyssey, on the other hand, had been passed from mouth to mouth for many generations before the introduction of writing into Greece, and, what with the imperfections of memory, and the temptations to glorify the past, had become so incrusted with legend that, although they preserve for us invaluable pictures of an early civilization, these poems cannot be regarded as historical documents.

Thus the date that most surely sets the bounds between the history and the prehistory of a given people is that at which the art of writing was introduced. History depends upon written records, or at least upon inscriptions; prehistory reads past events from ruined struc-

tures, from flints and shards, from bones and teeth. If a prehistoric people were far advanced in culture, the archeologist finds the remains of a beautiful architecture, like the lion gate at Mycenæ or the temples of Yucatan and Guatemala; if less advanced, they would be represented by tools and weapons of bronze, ornaments of gold and silver, and fragments of pottery. Cruder people still would leave behind flint implements showing various degrees of skill in their manufacture, while beings not yet capable of making or handling even these pitiable works of art would leave the records of their lives and activities in their own bones which, occasionally preserved, form records pregnant with meaning to those who learn to decipher them.

Since, now, the bounds between history and prehistory are set by so arbitrary an event as the introduction of a certain definite art, an art easily acquired from others, and requiring only some slight degree of culture to use effectively, and since even a high degree of culture may develop and continue without any development in the direction of this particular art, it follows that the date of transition from the one to the other, the date of the introduction of the art of writing, is wholly a relative one. Probably the first men in the world to develop the ability to record thought were the early Egyptians, who are thought by Breasted to have actually been able to write during the last centuries of the fifth millennium before Christ, or seven thousand years ago. In comparison with this distant date, the earliest writing of the only possible rivals, the Mesopotamians, are more recent, and thus while the inhabitants of the Nile valley had already passed into the definite

historic stage, those between the Tigris and Euphrates were still "oppressed by the long night," and unable to make permanent records of their "heroes before Agamemnon."

The ancient Britons were a prehistoric people when first met by Julius Cæsar upon the sea beach at Dover; and so was the entire population of the New World at the time of Columbus. Thus here in America "pre-columbian" and "pre-historic" are synonyms, while the men of northern Europe first came into history at the hands of the Romans.

2. *The Relation of Geology to Prehistory.*—The most fundamental need in the study of prehistory is a means by which some form of chronology may be established, so that the events ascertained from the excavation and examination of the records may be arranged in their sequence relative to one another. A natural background, upon which these events may be thrown, is furnished by the science of geology, which has established with some exactness the chronological sequence of the changes of the earth's surface, and, in Europe and North America especially, has divided, quite in detail, the period of time contemporaneous with the first appearance and early development of man. This science thus supplies us at the outset with a mass of data of the greatest importance to the prehistorian, which will serve as a basis upon which the more special chronology of human prehistory may be established, especially since it furnishes the details of the climate, the characteristic animals and plants, and the topographical configuration of the land, at each stage. It will thus be well to review here the events of the more recent geological history, considering

especially those facts which may prove of importance in the present inquiry.

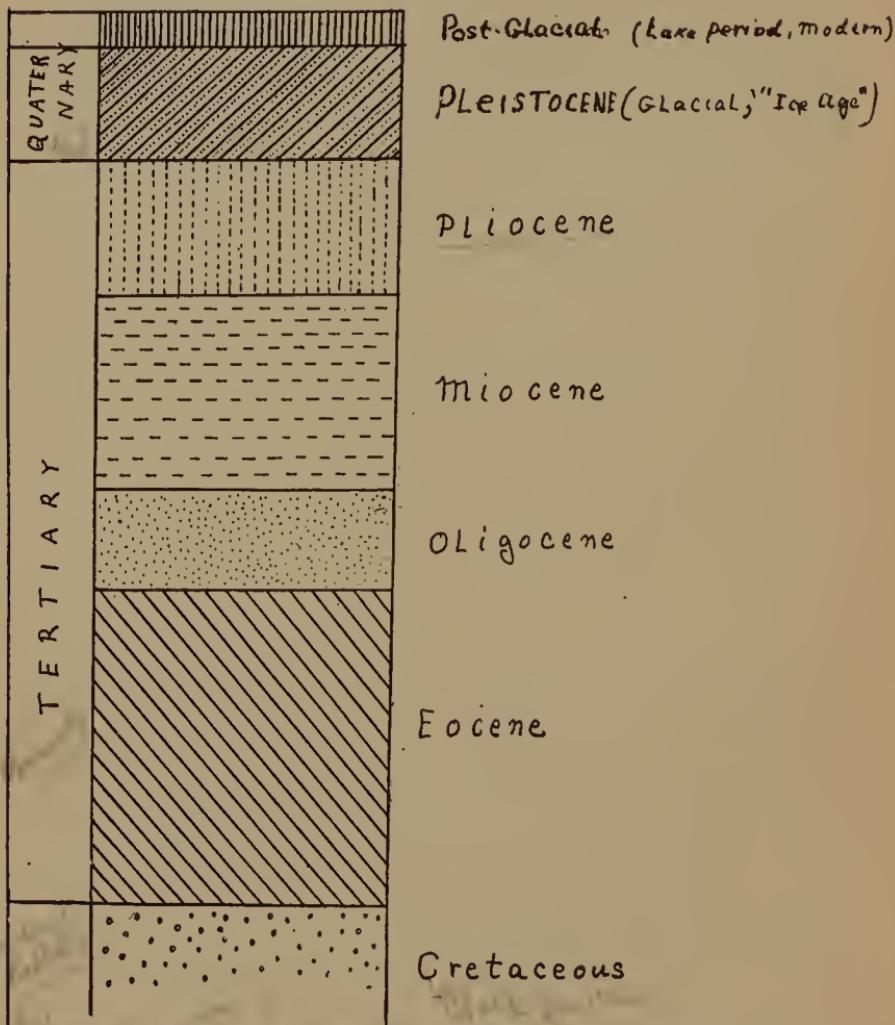


Fig. 1.—Diagram of late geological chronology, showing the subdivisions of the Tertiary and Quaternary Periods.

3. *Sketch of Tertiary Times.*—During the Cretaceous Period, a long subdivision of time immediately pre-

ceding the Tertiary, the climate of the entire Northern Hemisphere was tropical, nearly or quite to the Pole. The earth was clothed with a luxurious vegetation, in which palms and cycads prevailed, covered with trailing vines, and interspersed with enormous ferns.

This climate continued well into the Tertiary, but there eventually came the unmistakable signs of a gradual cooling. Among the palms and cycads there appeared such plants as the myrtle, the laurel, and the fig, plants that require a warm climate but cannot survive a continuous high temperature. Soon, also, came hardwood trees of quite modern types: the oak, beech, chestnut, willow and various species of sassafras, a tree now confined wholly to America, but then abundant everywhere. In the Miocene a few conifers appeared, interspersed among the palms, while the cycads disappeared, the climate being now too cool for these extremely tropical plants; and still later the palms were lost, and the entire flora became that of a cool temperate region.

This movement, however, did not stop with the temperate climate of the present day, but became decidedly cold, and in succession the vegetation became sub-arctic, and arctic, and then absolutely disappeared, when, finally, the country became sealed up in a covering of ice, well-nigh continental in extent, quite as is the case with Greenland at the present time. Thus, the Tertiary Age passed into the Quaternary.

In this gradual cooling of the Northern Hemisphere, which involved the entire Tertiary, a period of more than three million years, the extreme north was always a little in advance. Successively, the changes from tropical to sub-tropical, warm temperate, temperate, cool-temper-

ate, sub-arctic, and arctic, began at the north and spread southward, until, at the maximum cold of the Glacial Epoch, the coating of ice extended from the Pole half-way to the Equator.¹

While, corresponding to the gradual change of climate which, in the Northern Hemisphere, ran the whole gamut from tropical to arctic, the vegetation successively assumed the phases just described, the changes in the fauna were no less marked, and are of the greatest importance in the present inquiry. That most of the early phases in the development of mammals, the class of vertebrates to which man belongs, took place in regions still unknown geologically, is a conviction that unwillingly forces itself upon us, since, at the beginning of the Eocene, the first phase of the Tertiary Epoch, numerous well-differentiated members of this class suddenly appear. All through the enormously long preceding epoch, the Cretaceous, the deposits yet known, covering a part of the north temperate zone, yield very little evidence of mammalian history; while previous to the Cretaceous there are known only a few tiny jaws of creatures of the size of mice or rats, which show definite mammalian characters mingled with those of reptiles, as though these were the forms still in transition from the one to the other. But between this beginning in the Jura-Trias, and the Eocene, with its sudden appearance of typical placental mammals, well differentiated into most of the modern Orders, are interposed the millions of years of the long Cretaceous and the strata of

¹ To about 50° north latitude in the Eastern Hemisphere, and to about 40° in the Western, but with a very irregular southern boundary.

this epoch thus far known give us no hint of the intervening history. Where the events took place which gradually developed small reptilian forms with mammalian tendencies into the large and important class as it manifested itself in the Eocene, can only be surmised, but as this appearance took place simultaneously both in Europe and America, in fact over the entire north temperate zone, it is extremely likely, first, that the phenomenon was due to a migration from elsewhere, and secondly, that this unknown center of dispersion must have been about equally distant from both northern continents. Naturally but one region of the globe fulfills this condition, namely, the Polar region, which we are accustomed to associate, not with life, but with death and absolute sterility; yet during the Cretaceous the extreme North, even the Pole itself, possessed a warm, and even tropical climate, and was thus very fit to be the cradle of the placental mammals.

Be this as it may, points impossible either to verify or refute until the strata of the extreme North become better known, mammals of many sorts, although still primitive and generalized, appeared in numbers at the beginning of the Eocene, the ancestors of our present-day groups. Aside from primitive rodents, carnivores, and insectivores, there were numerous types of hoofed mammals, in which could readily be seen the early forms later to be differentiated in the rhinoceroses, the camels, and the horses of modern times. Of more special interest to us there were numerous early Primates, small arboreal forms with the general appearance of lemurs, such as the more generalized lemuroid, *Notharctus*, and the more specialized *Anaptomorphus*, a half-human kobold

of squirrel-size and ridiculous appearance, yet one in which, together with his living relative, *Tarsius*, some have seen the stem leading up to man at its inception.

Through the later subdivisions of the Tertiary may be followed the history of the development of modern types; so that the fauna of each period became gradually more and more like that of the present time. In the Miocene true anthropoid apes, allied to the gibbons and chimpanzees, appeared in Europe, and the famous transition form, ape-man or man-ape, *Pithecanthropus*, of which certain important fragments were found in Java in 1891, was probably of Pliocene date.

Toward the end of the Tertiary, too, come other indications of the presence of activities of at least some extremely intelligent ape, if not something more human. Numerous flint fragments occur, bearing curious chippings difficult to explain as the result of any of the inorganic forces, yet easy to understand if they had been grasped by hands like ours, and used for the cruder motions of striking, prying, or cutting, the so-called Eoliths. There have been found also bones with curious scratches upon them, not the marks of the teeth or claws of the Carnivora, and pointing to the same conclusion. In short, although it would be too much to assert that man, as we know him, existed during the Tertiary, there is yet the feeling of man's near advent, and more and more the visible impressions of a new and active force, beginning to record his autobiography.

4. *The Great Ice Age.*—When, after the long cooling of the Tertiary, the northern portion of the world finally succumbed to the cold, and lay under the pall of the glacial ice, it was by no means a period of stagnation,

devoid of results. Wherever the land sloped, especially along the great mountain ranges, the ice, like a layer of some viscid substance, was slowly slipping and flowing, grinding off the rocks, transporting soil and small pieces of stone to the valleys and disposing of these materials in the form of nicely rounded hillocks, to form, later on, vast areas of rolling country, covered with gravel. More than once, perhaps even five times, as some say, during the four hundred thousand to five hundred thousand years of this Glacial Period, the ice retreated to the far north, leaving bare great stretches of country which were soon populated from the south by those plants and animals that were adapted to a cool climate; and here, during the later retreats of the ice, man himself, or a creature not unlike the man of the present day, came also, to hunt over the plains or to shelter himself in the caves. These retreats were very slow, too slow for man or animal to notice it in a single generation, and these *interglacial periods*, as they are called, were of sufficient duration to allow man to live upon the reclaimed territory for an epoch at least as long as that of the entire known human history before a renewed approach of the cold gradually compelled him to migrate again beyond its reach.

Certain large territories, too, extending for quite a distance north, seem for some reasons never to have been covered with the ice; and thus the ice limit was not a straight line, but a very irregular one, with large free areas running north, and long capes of ice dipping south. These free areas included, for example, the west coast of France, nearly all of Alsace, and large parts of Germany and Austria, and all such were never ice-covered,

and thus were continually habitable by early man. In these ice-free areas there was found an abundance of the larger mammals. One species of European elephant, indeed, the *Elephas antiquus*, adapted only to a warm country, was not able to endure the first approach of the cold, and died out at the beginning of the period; but its place was taken by the allied *Elephas primigenius*, the hairy mammoth, whose long coat of hair fitted it for the change of climate. The wild horse (*Equus antiquus*) and the reindeer (*Tarandus rangifer*) wandered over the plains in vast herds; and there were also two large species of ruminants, the one (*Bison europaeus*) a near relative of the American bison, the other the "ur," or "auerochs" (*Bos primigenius*), whose blood still flows in certain breeds of our domestic cattle, notably the Holstein. In the caverns on the mountain sides lurked the cave bear and cave hyena (*Ursus spelæus* and *Hyæna spelæa*) formidable foes of early man; the first was perhaps identical with the "grizzly bear" of the Rocky Mountains, and the second was much like the African hyena, long exterminated in Europe.

In the caverns also, disputing the right of domicile with the bear and hyena, there were found during the later portion of the Ice Age several different man-like forms. Some were veritable ape-men, with overhanging brows, projecting jaws, and with the chin sloping back from the base of the lip. They crouched as they walked, with head thrust forward and back bowed; their legs, of almost human proportions, were curved. Others shared a close approximation to the modern type, and it is evident that the latter part of the Ice Age witnessed the appearance in Europe of men having the bodily characteristics of

the present species. The ape-men, distinctly lower and less able to cope with their superior ally in the struggle for existence, died out during this Age, and their disappearance, together with that of the transition forms of the late Tertiary, gave man the complete isolation from other animals so long emphasized by earlier naturalists and philosophers as proof of his separate origin.

What relation was sustained in these early times between these various types of intelligent primates we do not know; but they all seem to have used, and probably fabricated, the various stone implements characteristic of the period, which were designedly shaped and represented a great improvement over the eoliths of the Tertiary. Perhaps the highest type only gained the knowledge of the use and control of fire; perhaps the lower types were looked upon by the others as unlike themselves, and even hunted as food; of these dim times we have at present but a comparatively small number of remains; but information is increasing almost daily, and we may ultimately find an answer to these and many such questions which suggest themselves.

5. *Glacial Action and Its Results.*—A great ice-sheet, lying along a step slope between mountains, constantly flows downward, although at a very slow rate. Continually reinforced by the precipitation of moisture over the mountain tops above it, it acts like a slow-flowing viscous mass, of great weight and power, moving under the impulse of gravity. Where there is a change in the angle of descent, so that the mass has to bend, as where flowing over a crag, it develops numerous transverse fissures or cracks, familiar to students of glaciators under the name of *crevasses*. As such a mass drags itself between

the rocky sides of mountains, pieces of all sizes become detached from the sides of the ravines and drop on the surface of the ice, through which they gradually settle until they reach the bottom. Here they come in contact with the glacial bed, and, held firmly in the ice, as by a hand, they rub against the underlying rock, one or both of the contact surfaces being ground in accordance with the relative hardness of the two. An ice sheet is, then, sometimes more than a viscous, flowing mass: it is like a gigantic piece of sandpaper, its under surface studded with rocks of all sizes, which are held in the ice with considerable firmness, and it is largely through their agency that the surface over which the ice flows becomes cut down and denuded of all its softer materials. In many places during the Glacial Period the surface has been cut down for a depth of five to ten thousand feet, and all of the debris coming from this erosion has been deposited lower down, at points where, through the meeting of counter currents, or from some other cause, the motion becomes reduced. Such glacial deposits consist of material known as glacial gravel, which may easily be recognized by certain definite characteristics, and may thus be always sharply distinguished from deposits formed by the action of water or other natural forces.

In the first place, a glacial deposit contains stones of many different sizes in contact with one another, that is, the material is unassorted, while in a deposit formed by water, the ingredients are arranged in accordance with size; in the second place, the shape of the separate stones differs in the two cases. Pebbles hurled together by the agency of a strong current of water, either waves or cas-

ecades, will on the average be struck equally on all sides. They will consequently wear smooth, and assume a rounded, oblong, or oval form, without corners or sharp angles. A glacial pebble, on the other hand, seized and held fast in the grip of the ice, will have at least one side planed down and often polished, while the rest remains crude and rough. It will, however, be occasionally turned over, through striking against some unusual obstacle, and then another side will become planed. Owing to the friction at the lower surface of a glacier a fragment of rock, newly torn from its original quarry, will tend to place itself so that its largest axis lies directly across the stream, at right angles with the direction of motion, and it thus happens that, while retaining this position, its motion will consist of an irregular rotation along this axis, which will cause it to assume the form of a prism, usually with three easily recognized sides. The ends, which in all this rolling remain imbedded in the ice, will receive only a chance impact, and thus glacial pebbles are frequently met with, irregularly prismatic in shape and well smoothed, but with one or both ends still showing the roughness of the original fracture. Such a fragment of rock, worked down by glacial action, whether small or large, is termed a *glacial boulder*, and in all glacial deposits they are constantly met with, and form the main characteristic of the deposit.

Glacial gravels may in places be spread quite evenly over the country, but are more apt to be piled up, either in long rows which resemble dikes or ramparts, or in the form of oval hills, called "hog-backs," especially characteristic glacial features. In these latter the form is quite geometrically oval, the longer axis at right angles

with the direction of the ice current that deposited it. Glacial gravels may also be deposited in definite layers, the layers being often characterized by a difference in the average sizes of the constituents and representing some change in the depth, force, or direction of the ice currents. As such a change can be occasioned only by a considerable difference of level and slope in the surrounding land surface, the time period between two successive layers now in contact may be often very great, and the lower and upper layers of such a deposit may thus be separated in time by many thousands of years.

6. *Chronology of the Ice Age.*—As would naturally be expected, these glacial gravels, the direct result of the grinding of the ice masses, do not usually contain organic remains, but they are still of much value to the prehistorian, since upon them is based the entire chronology of the Ice Period, and the position of remains relative to these deposits is often the vital point in the dating of prehistoric events. Thus, from the deposits as studied in and about the Tyrol, taking into account also the extent of the erosion, in fact, all the results of glacial action, the physical geographer Penck has established for the region studied, and presumably for all Europe, four successive advances, with three intermediate retreats, of the great ice sheet.¹ These, named from local rivers in whose valleys the characteristic deposits occur, are the following:

¹ Penck, "Die Alpinen Eiszeithildungen und der prähistorischer Mensch." *Archiv für Anthropol.* 1904, pp. 78-90, cf. also, Penck and Brückner, "Die Alpen im Eiszeitalter," Leipzig, 1901. Obermeier has also compared glacial chronology, for which cf. "Les formations glaciaires des Alpes et l'homme paléolithique." *L'Anthropologie.* T. XX, 1909, pp. 497-522.

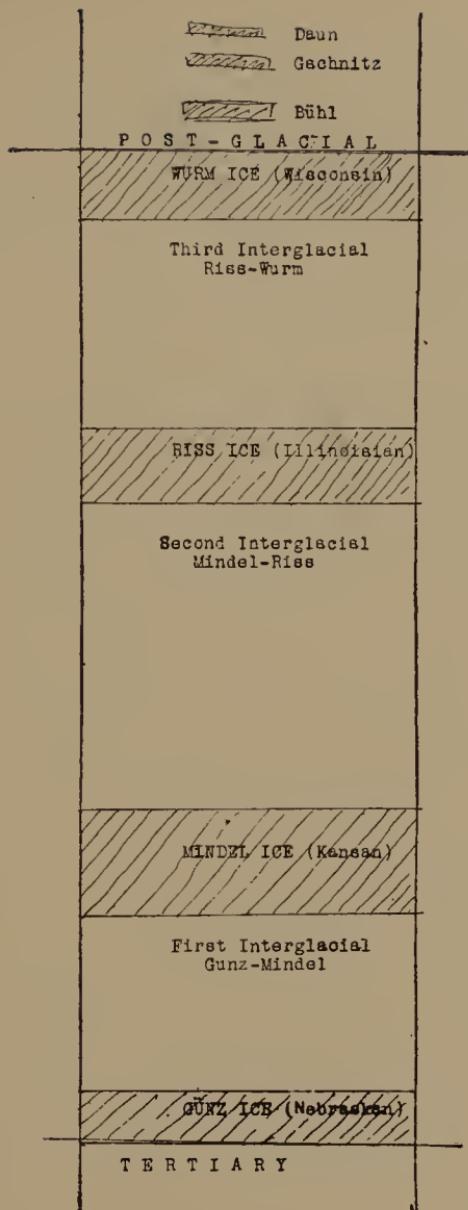


Fig. 2.—Diagram of the glacial advances and retreats, with the minor glaciations of early post-glacial times.

- Günz Ice (1st Glacial Period)
- Günz-Mindel Interglacial Period
- Mindel Ice (2nd Glacial Period)
- Mindel-Riss Interglacial Period
- Riss Ice (3rd Glacial Period)
- Riss-Wurm Interglacial Period
- Wurm Ice (4th Glacial Period)

As is usual in the case of geological subdivisions, the earlier periods were the longest in duration, the length of time for each period growing gradually shorter. The entire interval from the retreat of the Wurm Ice to the present has been less than that of the Riss-Wurm Interglacial Period alone, and thus, although it is assumed, from the more complete retreat of the ice, that the periods of glaciation are over, the present may be, after all, only a fourth interglacial period, eventually to be followed, as has repeatedly happened in the past, by another advance of the cold.

This chronology of Penck, although worked out primarily from the geological standpoint, and without special reference to man, was harmonized by this author with the early human chronology, as established by de Mortillet upon the remains of glacial man and his handiwork. It may thus be conveniently taken as a background for the study of early man, as the series of events upon which to base early human prehistory.

Were all the deposits of the Glacial Period those formed by the ice, the direct result of the grinding of the glaciers, few if any actual remains of either man or

his contemporary animals would have come down to us; but, fortunately for the prehistorian, the period was not entirely one of glaeiation, and both in the ice-free regions, and everywhere during the long interglacial periods, there were laid down many deposits that have yielded much. Such are the *river terraces*, and the glacial *sand dunes*, and other eolian (or wind) deposits, known in general as *loess*.

7. *Post-Glacial Times*.—There came a time, after the last main advance of the ice, when the retreat continued far beyond the bounds of any previous interglacial period, and the present day still shows a continuation of this movement. The ice has now long left the entire continent of Europe, save where its last traces still remain on the higher elevations of the Alps and in a few other places, but Greenland and all the circumpolar countries remain covered by it. The date of this last retreat is variously estimated; some say that the greater part of Europe was ice free as far back as from twenty-five to thirty thousand years ago; while others make a longer estimate. At all events, it was very recent, geologically speaking, and it is quite possible to begin a chronology in years, using round numbers, and giving considerable latitude in limits.

Although, after the final retreat of the Wurm Ice, there was no further advance of the cold of nearly as great severity or duration as in the case of the previous ones, there were yet several lesser local glaciations affecting the entire Alpine system of central Europe, and including the Alps proper, the Pyrenees, and the Apennines. As with the four great Ice Periods of the Quaternary, these were successively milder and milder; the

ice line stopped at a higher level, and the period was successively shorter. These lesser ice intervals, occurring during the early part of the Post-Glacial Period, were named from rivers in the Tyrol, as in the case of the greater glaciation, and were likewise included in the fundamental researches of Penek. The *Bühl* ice appeared after an ice-free interval that ushered in the Post-Glacial Period and extended over a period of time from about 24,000 to 16,000 B.C. This was followed, after a warmer interval, by the second post-glacial glaciation, that of the *Gschnitz*, between perhaps B.C. 13,000 and 9,000. The final glaciation, that of the *Daun* ice, was confined to the higher lands of the Alps themselves, and made its appearance about seven thousand years before the Christian era. The present-day Alpine glaciers, although greatly reduced, may be considered the final remnants of this last glaciation.

While these later returns of the ice ages affected the development and environment of man locally, the country outside of the Alpine areas, and during the interglacial intervals even there, showed the general characteristics of the post-glacial times. The most striking physical characteristics of the country left free by the retreating ice sheet was the abundance of water courses, which frequently expanded into chains of sizable lakes, much as in the case of Finland now. The land near the edge of the ice became clothed by a flora such as is now characteristic of subarctic regions, like Labrador, or like that of high mountain regions, but at a lower zone, creeping northward as the glacier retreated, appeared a more temperate flora. These plants were mostly or wholly modern species, still characteristic of regions with

similar climate, and the leaves and branches enclosed in the mud at the bottom of those early lakes, in what is now the temperate part of Europe and America, belong to species occurring at the present day in Alaska and Labrador, or upon the high Alps. These chains of lakes, or locally expanded rivers, as they may be considered, were practically in the same locations as the rivers of the present time, for the glacial epoch, with its grinding down and its depositions, had sculptured the surface of the land into approximately its present shape, and the rivers which ran from the melting ice chose the lowest levels for their courses, and in so doing defined the present river valleys. During the post-glacial time, however, this extensive water system has exerted its eustomary force in eroding and cutting down in one place and depositing in another, and has thus put the finishing touches on the modern landscape of the area involved in the form of lake and river terraces, deep ravines and cañons, and those broad alluvial plains which play so large a part in the agricultural interests of the present-day world.

While now the post-glacial waters were at work preparing the surface for later man, laying out wide areas of arable ground, and cutting down the ravines for the future reception of railroads and telegraph lines, man himself was developing in such a way as to be ready to use these advantages. The ape-men had gone, and with them the mammoth, the cave bear and the cave hyena; the dog, the sheep and goat, and perhaps some other animals, had been domesticated; and the man of the present type, forsaking the rude rock shelters, had learned to construct various kinds of houses in the open. Taking

advantage of the lakes, he became in many places a lake dweller, building extensive villages on piles driven into the mud and communicating with the shore by draw-bridges, which could be drawn up at night or in time of danger. His weapons were now made with much care and artistic in finish; he had learned to weave, first baskets, and then cloth, and to construct pottery. From now on his development is a study of human culture, and approaches the border of history, for while the central European was still at about this stage of his development, the Egyptians were building walled cities, and recording the great deeds of their rulers by means of symbols carved upon stone surfaces, the beginnings of written history.

But neither here, nor in Mesopotamia, nor in any other land which possesses traces of early writing, do we know what preceded this stage. We find in certain places symbols that stand for vocal syllables, fossil human speech, and when we listen to these ancient accents, heard but dimly through the ages, they speak, not of primitive peoples, but of dwellers in cities, with organized armies, and with a high degree of culture; yet in the soil, at times literally beneath the ruins of these civilizations, occur the cruder flints of Stone Age people, suggesting an earlier history, similar to crude beginnings elsewhere. There is the greatest need of exploration in all parts of the world, so that human prehistory may become more than a fragmentary one, and the fact that so much has been done within comparatively a few years gives us the greatest enthusiasm for the results of the future.

8. *The Work of the Post-Glacial Rivers and Lakes.*—Rivers and lakes, viewed as geological forces, are largely

responsible for whatever shaping of the surface of the earth has taken place since the Glacial Period, and thus a knowledge of them as dynamic powers, together with the kind of work they perform, is one of the first essentials for the prehistorian. For the study of this branch of knowledge the reader is referred to a good textbook of geology, while for the sake of unity an outline of the essential principles, in their relation to practical archaeology, is here presented.

The work of rivers consists in part of tearing down, and in part of building up—that is, of erosion and deposition. Furthermore, a river is uneven in its activities, which are subject to a definite seasonal rhythm. After the melting of the snows, and the consequent swelling of the volume of water, a river may temporarily become a torrent, doing work within a few days or hours which it is powerless to accomplish again until the next year; again, a river is a temporary structure, usually largest and most powerful at its beginning, shrinking to the size of a mere brook toward its close, and finally drying up altogether.

Rivers are naturally found coursing through the bottom of ravines, but it is also true that the ravines themselves are mainly the result of the erosion of the rivers that lie within them. When the ravine is very deep and the stream is very small, it is necessary to postulate a considerable extent of time in order to account for the large amount of excavation in proportion to the size of the agent, but it is also probable that when the ravine was commenced the stream was much more voluminous and the work was being more rapidly accomplished. The periodic change of power of such agencies must also be

taken into consideration, and it must constantly be remembered that even a small brook, when viewed in the summer, may still possess a considerable erosive power at the time of the spring freshets. Again, the tendency to cut a river bed deeper, well seen in the case of a ravine or gorge, is often counterbalanced under different conditions, by a lateral erosion of the banks. Thus, in the case of a river traversing a nearly level plain, or extensive meadow, the lateral erosion is far greater than that at the bottom, so that often the annual encroachment of the river, now upon one bank, now upon the other, becomes a serious matter to the inhabitants, while there may be no perceptible increase in the depth of the bed. When, however, a river, in traversing a level meadow, finally develops sufficient depth of bed to form a ravine, the former meadow may have become almost entirely eroded and carried off down stream while a narrow fringe, at the original level, and bordering the ravine upon one or both sides, is left as a *river terrace*. Such terraces, always, of course, far older than the river, are old in proportion to their height above the present river, and in cases in which there are two or more successive terraces, as may happen through the interposition of a second period of meadow-building with a subsequent erosion after the formation of a high terrace, the terraces are chronologically successive, that of the greater altitude being not only the older, but separated in date from the other by a very long interval. Thus a terrace, although a formation always associated with river action, is not a deposit of the present river, but the remains of an ancient meadow or plain, left through the erosion of the rest by river action, and itself the result of deposition,

probably by a previously existing lake, or the expanded portion of a previous river, which amounts to the same thing.

As for the second action of a river, deposition, it is, like all aqueous deposits, at each point dependent upon so many factors, the strength of the current, the velocity, the depth, the character of the material, and so on, that each small area may present a problem in itself. Naturally the most extensive deposition occurs over the bottom of still, expanded portions, which are practically themselves ponds or lakes. In other places a pebbly or a sandy beach may result from local currents, or other conditions, more or less limited in extent, or perhaps a delta of fine mud may be built out under water opposite the mouth of a turbulent tributary. All such deposits accurately picture the conditions that produced them, and when studied *in the undisturbed soil*, yield numerous details of the local environment at the time of deposition, and may be dated relatively to associated deposits.

All lakes and ponds, however large, are like rivers, strictly temporary structures, being gradually filled up by the accumulation of the particles of earth brought down in the waters of their tributaries and diminishing directly through the gradual shrinking of the tributaries themselves. Along the shallower borders also, a rim of vegetation is always ready to encroach upon the water, and by adding its substance to the rest assists locally to a not inconsiderable degree in the conquest of land over water.

The sediment brought down by the tributary streams becomes distributed, often quite evenly, over an ex-

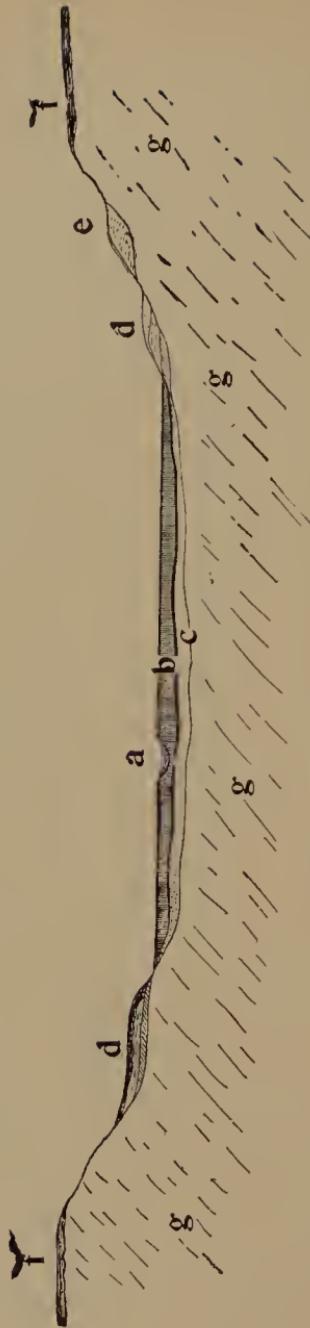


Fig. 3.—Section across the valley of the Somme in Picardy, France. (a) the present river; (b) layer of peat, 20 to 30 feet thick, and resting on a gravel layer (c). This latter was deposited over the bottom of a lake that filled the valley embraced between the points (dd), after its excavation (dd), lower-level terraces, the remains of an earlier lake bottom, which once extended entirely across the valley; (e), higher-level terraces, the remains of the bottom of a still earlier lake, which once extended between the points of (ff); (ggg), bed rock of chalk, in which the original valley, (ff), was excavated. (After Lyell.)

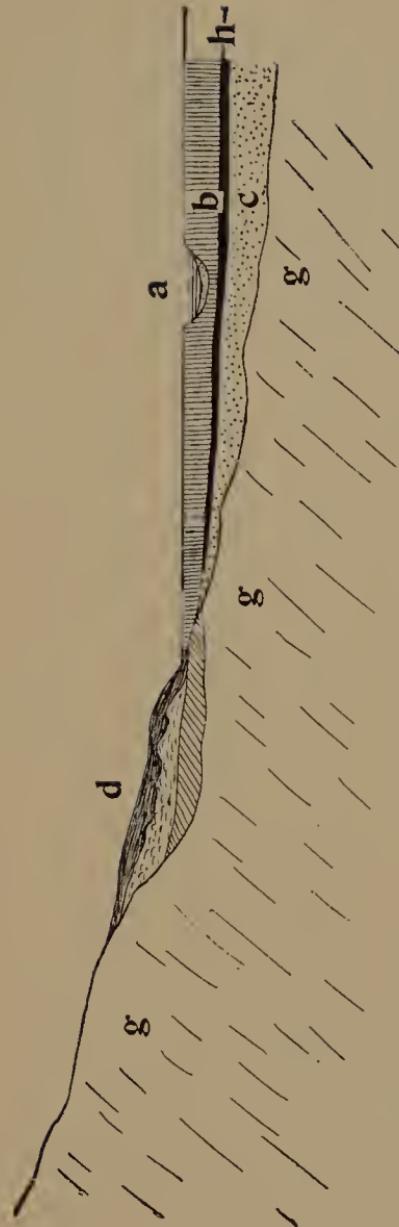


Fig. 4.—Detail of the lower-level terrace at the left of the previous figure, taken at Menecourt, Abbeville, (a), (b), (c), (d), and (g), as in the previous figure; (h), a thin layer of clay, deposited upon the gravel (c), and furnishing a substratum for the peat. The terrace itself consists of the three following layers beginning at the bottom:

1. A layer about 12 feet thick, composed of alternate beds of gravel, marl, and sand, containing fresh-water and land shells, with a few marine species at the bottom. This layer contains also bones of elephant, rhinoceros, and other Quaternary mammals associated with crude flint implements.

2. Calcareous loam resembling loess mostly unstratified, and about 15 feet thick. This layer also contains land and fresh-water shells and bones of elephant, etc.

3. Brown clay, with angular pieces of flint (not worked), and a little chalk rubble. This layer follows the slope of the hill, and is evidently washed down from above. It is 2-3 feet in thickness. (After Lyell.)

tensive area of water, and eventually becomes deposited on the bottom. In the case of fairly quiet water, as is general during the summer months, this sediment is of the finest possible grade, but in the time of the spring freshets, larger particles are borne down in the turbulent waters, and thus in places annual layers are formed of coarse spring materials alternating with the finer particles characteristic of the rest of the year. Many river and lake deposits thus consist of definite annual layers, which in some places are so distinct as to be easily counted, and furnish an absolute means of determining the length of time consumed in laying down the entire deposit. Thus a river terrace, formed by a river which has eroded and carried off the remainder of a former lake bottom, may indicate exactly the length of time consumed in its formation, although the other features of the problem, such as the subsequent erosion itself, and the formation of the river valley at a lower level, are independent problems, with no possibility of such definite solutions.

9. *River Terraces.*—The river terraces with which the prehistorian is especially concerned are those of the Quaternary Period, formed, for the most part, by the interglacial lakes and rivers, and subsequently left as the result of erosion by later ice or by water torrents. Such deposits are shown in the accompanying diagrams (Figs. 3 and 4), which are based upon the conditions found in the valley of the river Somme, near Abbeville, Picardy, in France, a classical locality for the study of the glacial man. The original valley, the boundaries of which upon either side just come within the limits of Fig. 3, was excavated, by ice or water, or both, in the bed rock of

the region, a calcareous deposit of the late Mesozoic. During the period at which this basin was occupied by a lake, or a broad, sluggish estuary, it became filled up by gravel to the top level of the upper terrace, *e*, which then extended across the entire valley, from side to side. Later on, when, perhaps, the lake was replaced by a glacier, this deposit was cut out, with the exception of the present terrace *e*, a little remnant which, for some reason, was not torn out with the rest. Changing, now, this glacier for a second lake, a second period of deposition followed, this time filling the valley to the top level of the terrace *dd*. Again came a period during which the valley was cut out again, leaving at this time terraces along both sides of the confining walls, those at *dd* in the diagram. The lake that followed this second denudation laid down the deposit *c*, and upon this a thin layer of fine clay (*h* in Fig 4) and then flowed away, leaving a marshy bottom, upon which, through the long continued growth of sphagnum moss, a thick layer of peat, *b*, gradually accumulated. Finally, the drainage of the valley became concentrated into the present river Somme, which now drains the peat, and has already deposited along its bottom a thin layer washed from the bed of its tributary streams higher up. If, now, we read these changes backward, the relative ages of the peat, the deposit *c*, the lower, and the higher terraces, may be computed. The peat, practically the latest deposit, is here twenty to thirty feet in thickness, and, as the accumulation is very slow, depending mainly upon the slight annual growth of the moss, which has been calculated to be a little more than one inch in a century, represents many thousands of years. Before this came, successively,

going continually backward, the gravel deposit *c*, the cutting out of the earlier deposit now represented by the higher-level terraces *e*, and, earliest of all, the slow formation of the vast deposit of which the terrace *e* is the remnant. It is thus plain that a very long period has elapsed since the formation of the terraces *d* *d*, and that the terrace *e* is much older still, and yet both levels *d* and *e* yield not only the bones and teeth of elephants, rhinoceroses, and other animals of the glacial period, but also numerous elaborated flints, implements of the crudest description, though unquestionably shaped by man. These are, moreover, always found in the undisturbed strata, and placed in such relation to the animal remains spoken of so as to leave no doubt of their contemporaneity. Everything in these deposits, including both elephant bones and worked flints, must have been brought there by the force of the same water currents that laid down the deposits, after the soil forming the terraces was originally made, and the possibility of a subsequent intrusion of those objects is absolutely excluded.

In Fig. 4 is given a detail of one of the lower-level terraces of Fig. 3, in which its composition is seen. This consists in this especial case of three distinct layers, of which the two lower ones were part of the original deposit, while the most superficial one is much later. The lowest one of all, and the one that contains the remains, is itself stratified, and must have been formed under water; the second may have been in part a sand dune, deposited by the high winds of the ice age after the lake had been transformed into a glacier.

10. *Eolian Deposits; Loess.*—While the glacial gravels,

mostly distributed irregularly in the form of moraines, drumlins, and other characteristic formations, are due to the direct action of the glacial ice, the violent wind storms of the glacial times have occasioned much modification of glacial deposits in places, and covered the surface with local deposits of drifting sands. These *eolian*, or wind-produced deposits bear the general name of *loess*, and are occasionally rich in objects, of date contemporary with the formation itself, and buried beneath the drifting sands.

Loess is never definitely stratified in regular layers, as is the case with the clays that accumulate at the bottom of ponds and other quiet water; neither is it without system, like glacial moraines, but it has a definite and characteristic structure, which is best seen in sections through a sand drift or sand dune, originally a hill of wind-blown sand, heaped up as the result of successive storms. Such a drift, like a snow-drift, will be first brought together as the result of a definite wind-storm, where the configuration of surrounding objects causes a drift to form in a certain spot. The action of subsequent winds, changeable in violence and direction, will reform and sculpture the surface, removing material here and adding it there, the new material attempting ever to conform to the shape of the surface it finds. Each deposition tends to be stratified, its line parallel to the underlying surface, the whole presenting in section the successive results of such treatment: areas of semi-stratified sands resting unconformably upon those beneath them.

Areas of drifting sands, whether piled up into definite dunes or not, often yield objects of great value, since the

winds occasionally uncover and lay bare objects that have been confided to their keeping, they also, and more frequently, serve to bury objects dropped upon their surface. One disadvantage, however, comes from the scattered nature of these objects, both in distance apart, and in level, and another results from the lack of necessary contemporaneity of objects found closely associated. All we can definitely know concerning the dates of the objects collected in the loess, is that they were either contemporary with the storm that buried them, or that they were older, but were gathered together by a single storm, perhaps, even, by a single gust of wind. At the same time, with all its disadvantages and uncertainties, loess is a valuable storehouse of prehistoric materials of approximately glacial age, and many important objects have been rescued from it.

CHAPTER II

MATERIAL AND METHODS

Methods of Ascertaining the Age of Remains—Rock Shelters (*abris sous roches*)—Caverns, and the Remains Found in Them; Cave Paintings—Kitchen-Middens—Remains of Houses and Hearths—Tree Houses and Lake Dwellings—Crannogs—Forts and Scharrachs—Cornfields, Dew Ponds, and Cattle-ways—Megalithic Monuments—Graves and Burial Places—Mounds and Tumuli—Cists, Tombs, and Sepulchral Chambers—Special and Peculiar Methods of the Disposal of the Dead—Town and City Sites—Culture Sites Buried beneath Volcanic Deposits—Search for Objects Lying under Water—Chance Findings.

11. *Methods of Ascertaining the Age of Remains.*—From the brief sketch of recent geological formations outlined in the previous chapter it becomes plain (1) that different portions of the soil have been deposited by different agencies and at very different times, (2) that the age of these deposits relative to one another can be estimated, and (3) that in many cases the approximate age of a deposit or of a given layer in a deposit may be calculated by ascertaining the amount of work done (erosion, deposition, etc.) taking into account the probable strength of the agencies that accomplish it. Furthermore, it follows that *in an undisturbed deposit* or layer, with other deposits lying equally undisturbed above it, as may be seen in a vertical section through the entire structure, all the objects included must have been put there at the time of the deposit, whether they be merely

sand and stones, or bones and teeth. It is, however, not always easy to prove that a given object was an original part of an undisturbed deposit, and certain frequent causes for error must be guarded against. An object, originally foreign to the formation in which it is found, is called *intrusive*, and its presence may be due to one of several agencies, the most usual of which are the following:

(1) *Designedly buried by man.* An illustration of this is the case of a burial where the grave is dug within or through another deposit, naturally without reference to the structure of the latter. The soil usually selected for interment is that of some geologically recent deposit, either glacial, lacustrine, or fluviatile, and is very often arranged in layers. Here the intrusion is readily detected, since, in digging the grave the layers are disturbed, and in sections are evidently disarranged, and quite unlike the soil beyond the excavation. A more difficult case of intrusive burial is one where an artificial formation, made by man in the first place, is used by a later culture as a burial site. This is frequently met with in the Indian mounds of the United States, which offer places of great convenience for burial because of the softness of the earth, the freedom from stones, and so on. Such places are constantly selected for interment by peoples that have no traditions concerning the spots thus used, and are probably not related to the original builders.

(2) *Worked into the soil from above through the action of moles, earthworms, or other animal agents.* As an illustration of a displacement due to this cause may be cited the case of the skeleton of a Massachusetts Indian,

in which the bones of the right middle finger were found within the cranial cavity. As is usual in the locality from which this skeleton was taken, the body had been buried doubled up, with the hands applied to each other and placed beside the head. Through the action of some creatures, presumably earthworms, many of the smaller bones, especially those of the fingers and toes, usually become displaced or lost, and the instance cited was merely a rather extreme case of such a displacement. Modern iron nails are frequently found at a few inches of depth where excavation is carried on at a modern culture site. These are usually at such slight depth that their presence may be satisfactorily accounted for by the action of rains, frosts, or simply the tread of human feet; in other cases they may have been carried in with a fence post or other piece of timber in which they were imbedded. The complete decay of the post would leave the nails free in the soil, which, in ordinary digging, would seem to have been undisturbed.

(3) *Inadvertently loosened from a higher level during excavation, and found later at or near the bottom of the trench in close association with material belonging lower down.* Such a displacement is extremely liable to happen when excavating a deposit that lies in definite horizontal layers by the usual methods of making a vertical cutting through them. It is, in fact, so easy to occur and so difficult to rectify that an archeologist in critical cases trusts only in those objects which he finds in place, lying in the mould or matrix formed about it by the deposit. This matrix is necessarily in the exact form of the imbedded object, and in the case of a damp or clayey soil may preserve the form for some time;

besides this, moreover, the contact surfaces of matrix and included object are often colored by some chemical, and thus match each other in color with absolute precision. So close is the relationship of matrix to object that, even in the case of an object that has become free and is picked up in the bottom of the trench, the matrix from which it has fallen may frequently be identified and the proof of original position be given by fitting the one into the other. In the case of a complete match of matrix and object, both in shape and color, all chance of error is as completely excluded as in the case of the two parts of an irregularly torn document, such as were used in certain legal procedures in the Middle Ages.

Wholly aside from the dating of remains from the deposit in which they occur, there are several other methods often conveniently applied. Thus an important set of data may be derived from associated remains, especially those of animals. As instances of this may be cited the finding of a flint implement in an undisturbed deposit of gravel in close association with, or a little below, the tooth of a mammoth. A very simple instance of this principle, although of a much later time, is the discovery, among Mycenean remains, of an Egyptian coin, bearing the cartouche of a king, the date of whose reign is definitely known. This would fix the oldest possible date, though of course not necessarily the most recent, of the associated objects.

In cases where the objects of which the age is to be estimated consist of articles of human manufacture, technically called *artifacts*, extremely valuable data lie in the study of the objects themselves, including their size, shape, degree of art used in their construction,

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human occupancy. Where the men have lived they have gradually built up deposits consisting of the bones and teeth of the animals used for food, mixed with ashes and charcoal, and an occasional stone or bone tool. Indeed, in these rock shelters, as they are technically called (the *abris sous roches* of the French archeologists), there may be found, within a small area, thousands of objects of



Fig. 5.—Rock shelter (*rocher en surplomb*), situated above the village of Les Eyzies, Department of Dordogne, southern France. Structures like this, and also actual caverns, occurring in quantity hereabouts, were once plentifully used by paleolithic man, and the region is an especially notable one for the study of early human prehistory. The stations of La Madelaine, le Moustier, Laugerie basse, Laugerie haute, Cro Magnon, and others occur in the immediate vicinity. (After Déchelette.)

great value for the study of early man, and as these men were possessed of only a low degree of culture, and superposed their deposits directly upon those of a previous occupancy, such sites may present several different layers, distinct from one another, and representing as many different cultures, thousands of years apart.

As a good typical illustration of this sort of site the prehistoric station of Schweizersbild may be taken, a Swiss station some four kilometers north of Schaffhausen, and thus near the Rhine, where it is yet a small stream. The spot has long been popularly believed to



Fig. 6.—The northeast, or principal, entrance, into the Kesslerloch, near Schaffhausen, Switzerland, a typical rock-shelter. (After Heierli.)

be the abode of evil spirits, and when the first scientific excavations were attempted, in 1892, there was much local distrust lest the excavators might find the great war chest of the French, supposed to have been buried there in 1799, and guarded since then by specters.

The first exploration ditch, run perpendicularly to

the face of the cliff, outward to a distance of 13.5 meters, cut down through five layers into the glacial gravel. These were designated as follows, from the surface downward: (1) Humus, 40 cm.; (2) Gray culture layer, 45 cm.; (3) Breccia, with the "upper rodent layer," 80 cm.; (4) Yellow culture layer, 30 cm.; (5) Lower rodent layer, 40 cm. Below this lay the glacial gravel, with very occasional animal remains, but with no signs of human activity.

As the spot was long used, during the Middle Ages, as a place for pilgrimage and later as an encampment for gypsies, and as a popular resort for fishermen and picnic parties, the *humus*, or top soil, was filled with objects suggestive of modern culture, such as pieces of glass, nails and screws of iron, horn and bone buttons, beads, and even rings. A little clay image of the Virgin was strongly suggestive of some mediæval pilgrim, while there were found a few objects of bronze, dating back to a pre-Roman culture.

The *gray culture layer*, beneath this, was Neolithic, as shown by numerous fragments of crude pottery, both glazed and unglazed, and by stone tools with a smooth surface. The gray appearance of the entire layer, from which it received its name, was due to the infiltration everywhere of ashes and charcoal, and the whole was plentifully mixed with the bones and bone fragments of the various animals used for food. These displayed the typical fauna of the European forest, with a preponderance of deer, the whole corresponding closely to remains occurring in the Swiss Lakes, and also deposited as refuse from the kitchen.

The *Breccia layer*, named from the limestone frag-

ments, eraeked off from the neighboring cliff, formed a relatively sterile layer, where the signs of human activity were limited to a few spots. It indicates a long transition period between the Neolithic culture of the

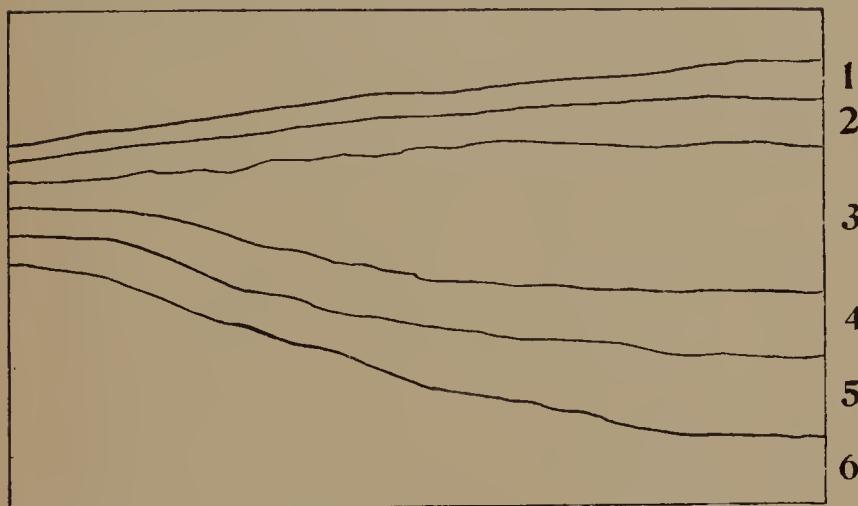


Fig. 7.—Section through the superposed layers in front of the rock shelter of Schweizersbild, near Schaffhausen, Switzerland. Obtained by first photographing the east wall of the excavation, and then drawing the boundaries of the different layers directly upon the photograph. The left side of the figure is close up to the foot of the cliff.

1. Humus layer; culture of bronze and iron ages, modern times.
2. Gray culture layer (neolithic) remains of forest fauna.
3. Breccia layer and upper rodent layer, without human culture; transition fauna between steppe and forest.
4. Yellow culture layer (paleolithic); steppe fauna, sub-arctic.
5. Lower rodent layer, paleolithic culture; fauna of the arctic tundra.
6. Glacial gravels, no animal remains. (Redrawn from photograph by Nüesch.)

superposed gray layer, and the yellow Paleolithic culture beneath them. The animals represented were mainly rodents, like rabbits, squirrels, dormice, and various sorts of mice and rats, their bones, in places, forming an "upper rodent layer," semi-distinct from the Breccia layer, in which it is included. The only large mammal that occurs with any frequency is the

reindeer, which, with many of the rodents, shows a landscape in transition from the steppes to the forest, with a colder climate than at present.

The *yellow culture layer*, the color of which is due to the presence of innumerable bones of animals, shows by the absence of pottery as well as by the crude type of the stone implements included, to be a deposit of typical Paleolithic culture. The fauna indicated by these bones, which are the refuse of human feasts, is that of the sub-arctic steppe, the reindeer predominating, while the arctic fox occurs in association with his more southern companion, the common fox of the temperate zone, as well as the wolf and the bison.

The remains found in the *lower rodent layer*, still lower, give us the picture of the genuine arctic tundra, with its frozen bogs, a condition which immediately followed the final retreat of the ice. Here man, already in possession of this poor shelter, pursued the reindeer, and other large mammals, skinned them, and made himself clothing from their skins. This layer rested immediately upon the gravel of the terminal moraine, deposited probably by the Wurm Ice.

At the bottom of the yellow culture layer, and resting directly upon the lower rodent layer, there was found a well-built hearth, made of three flagstones, fitted together. They formed a circular platform of some forty to forty-five cm. diameter, and covered with ashes, and in these latter were imbedded several rounded cooking stones, the whole forming the oldest hearth site in that part of the country, and one of the oldest known. Not far from this, but above this level, in the gray culture layer, a second hearth was found, about which were

placed, in a rough circle, a series of stone blocks which evidently served as seats.

While among the Paleolithic deposits no trace of human bones or teeth was found, so that we may conclude that the bodies of the dead were taken beyond the immediate settlement for disposal, the Neolithic people of the gray culture layer made many interments upon the spot. Here, naturally, the graves were dug down through the earlier layers, and thus, over each body found, there was a complete mix-up of the objects that belonged originally to different layers. These disturbances were impossible to overlook, and the objects found in all such places were kept by themselves, as being impossible to classify with exactness.

The total number of objects obtained in the investigation of this site, which lasted three summers, is almost incredible. The soil was excavated entirely by hand, it was subjected to several siftings in sieves of successively finer and finer mesh, and each separate piece was carefully marked. For the better examination of the objects found a series of tables were built on the spot, and at one time at least during the progress of the work, no fewer than twenty-seven tables were entirely covered with the materials. The richness of the deposits may be easily made out by looking through Dr. Nüesch's official report, which speaks, for instance of the 60,000 and more bones and bone fragments found. Of the reindeer fragments found in the two lower layers he enumerates 12,500 molar teeth, 420 jaws and pieces of jaws, 3,990 phalanges, 910 epiphyses of the humerus, and so on. Of Paleolithic stone artifacts more than 140,000 were found in the yellow culture layer alone,

and to these may be added many hundreds of implements made of bone or horn. These last included awls, needles, both with and without eyes, chisels, arrow and lance heads, staffs of officials, and a few etchings.

At the conclusion of the entire work the thousands of objects, each piece carefully labeled with all the data, were apportioned out among specialists, and reported upon. The animal remains, the Neolithic human skeletons, the geological conditions, even the various sorts of coal, and an analysis of the soil of the country, were made subjects of professional study by specialists, after which the total material was deposited in various museums in the neighborhood, for further inspection.

13. Caverns, and the Remains Found in Them; Cave Paintings.—While it is apparent that glacial man, during the long intervals between successive ice ages, and in the extensive ice-free areas of the ice ages themselves, lived largely in the open, and made himself master of field and forest, it is also true that he was wont to employ the natural shelter afforded by caverns, wherever such were available, as a protection from wild beasts, and from the rigors of winter weather. In regions where caverns are abundant, and where a choice between several is possible, the general preferences of early man—judging from the location of the signs of habitation—were much like our own, and thus the dwelling caves possess as a rule a fairly level floor, they are easy of access and well lighted, and usually open toward the south.

In judging of the former accessibility of a given cave one must not conclude too much from present conditions, for the time of the cave-men, at least in Europe,

was very long ago, and among other surface changes the river valleys have deepened considerably, so that many a cave, once situated almost on a level with a river bank, and easily accessible from along the beach, is now high and dry on the mountain side, far above the stream that runs along the bottom of a deep ravine. The early cave dweller thus walked easily enough in and out of an opening, to reach which the modern archeologist has need of ropes and scaling ladders.

Again, while in general easy accessibility is an advantage to a cave-dweller, there are occasionally conditions under which this very quality is a positive disadvantage, since it invites hostile attack, and renders the rightful inhabitant insecure. Such was the case, for example, among the American cliff-dwellers, who made their homes as inaccessible as possible, and rendered them available to their friends by a system of ladders, which could be pulled up at night, or in case of an attack.

In Europe the most celebrated caverns are found in southern France and northern Spain, and in the region about the head of the Adriatic, and extending down the eastern shore of that sea, the region known as the Carso or Karst. In the former localities are found plentiful remains of glacial man, as well as of those who lived soon after the last retreat of the ice; in the latter regions, the remains in general are those of men of the Neolithic times, and of the later Bronze and Iron Ages. Still, the Carso has as yet received much less attention than have the regions further west, and much may be learned from the limestone shores of the Adriatic.

The caves of France and Spain have long yielded plentiful artifacts from the deposits scattered over the

floor, and within the past few years their walls and ceilings have attracted even more attention from the vast numbers of paintings, executed in a bold and accurate style.

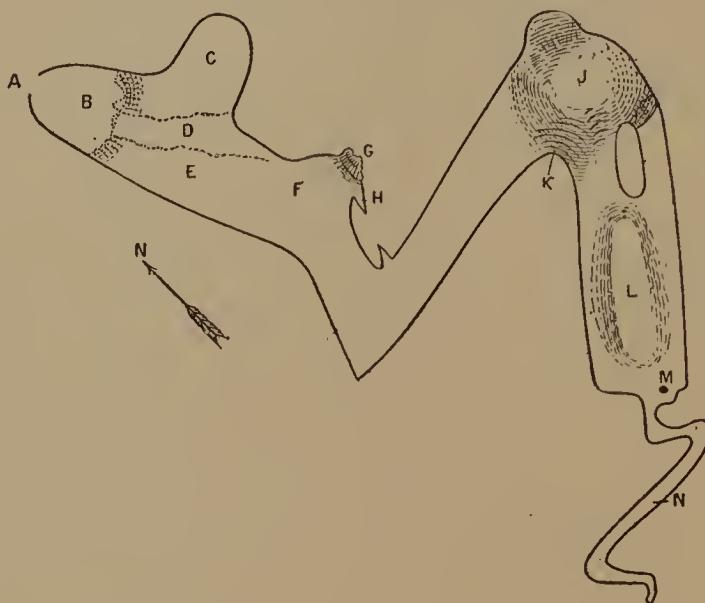


Fig. 8.—Plan of the cavern at Altamira, traced by M. Harlein, 1903.
 A, entrance; B, vestibule, filled with a mass of kitchen refuse and many pieces of rock fallen from the ceiling; C, hall on the left, with large frescoes; D, fallen rocks forming a wall; E, gallery on the right, leading to the hall; F, where one descends a cascade of stalagmites; G, and in to which there opens a recess; H, ornamented with red figures; I, gallery covered with great blocks fallen from the ceiling; J, vaulted hall, with an alcove; K, J, cascades of stalagmites leading to a large hall; L, in the form of a nave, and with a shallow well or pit; M, near the end; N, a terminal passage. The main frescoes appear on the walls and ceilings throughout the cavern, but occur especially in halls C and E, near the entrance. At places, as at K, the floor descends rapidly. The entire length of the cavern is 280 meters. (After Cartailhac, from *L'Anthropologie*.)

rate style, and portraying the animals of the latter part of the great Ice Age, the actual contemporaries of the artists. Many of the caves are literally lined with hundreds of bisons, bears, horses, and oxen, while the rhinoceroses, lions, and elephants are less numerous.

noeeros and mammoth served also as models. The paintings were executed, generally at about half life-size, in incised lines on the flatter rock surfaces, and usually colors were rubbed in over the areas thus defined. The black used was mainly charcoal, the reds and yellows were furnished by various ochres, and the white by chalk, and in the stillness of the caves these mineral colors have remained as new. Sculpture has long been known in the form of little statuettes of ivory or bone, found among the deposits at the bottom, but within a few years a room, deep in the cavern of Tuc d'Audoubert, on the French side of the Pyrenees, was opened up to the explorers, and there were found two clay bisons of about half size, a male following a female, and in the clay of the floor were the footprints of the Paleolithic sculptors, made as they left the sacred chamber for the last time. Recently, also, in the same general region life-size horses in high relief, were found quite in the open, upon the face of the cliff.

But while these mural paintings and sculptures, in part from their recency of discovery and in part because of their really great artistic merit, are holding much of the world's attention—that of others besides archeologists—the accumulated kitchen refuse deposited on the cave floors, and marking the actual site of the dwellings and hearths of early man, yields an inexhaustible supply of priceless documents, describing, in plain and unmistakable language, the actions of the daily life. Often, too, the same cave that furnishes these deposits has also, perhaps in the darker recesses, a gallery of paintings, evidently intended for display by lamplight, and in several cases the actual lamps have been found,

(See also Fig. 1)

sitting upon the floor at the base of some special painting, hollow, disc-shaped stones, with indications of the oils or fats that once fed them.

As these caverns are roughly contemporary with the Ice Age, the bottom layer of the deposits was for the most part laid down at that time, and here are found the remains, not only of the cave bear and hyena, but occasionally those of glacial man. Further up toward the surface occur the remains of later periods in chronological succession, and upon the surface may be picked up broken pieces of Roman and medieval pottery. The artifacts found in these deposits may be simply imbedded in the clay of the cavern floor, or may be still more permanently encased in a deposit of lime, furnished by the drip of water from the ceiling and forming in places the well-known stalactites and stalagmites. Such limestone masses, the *breccia*, with their imbedded artifacts, such as flints, the broken and split bones of food animals, charcoal, broken pottery, and so on, furnish most important documents of the activities of the successive periods.

The limestone region of the Carso has been a scene of excessive activity in cave formation, and as such is of the greatest interest to the geologist. In places the earth is absolutely honeycombed with the tortuous galleries and passages characteristic of this type of erosion, and at frequent intervals the surface has dropped through, over an area varying from a few square feet to a number of acres, breaking into a cavern or a series of them, and thus giving easy access to spaces that otherwise would remain unknown. These *sink-holes*, as they are technically called in America, are known in

the Carso by the Slavic word *dolina*, literally, a valley, and are so numerous in certain localities that they impart an undulating appearance to the whole country. Sometimes a cavern mouth is simply an opening revealed by the dropping of the sink-hole; sometimes it is the natural outlet for the stream of water that was responsible for the formation of the cave. In some cases there is no sink-hole, and a cavern is revealed by one or two small openings in the ceiling, where the roof has become very thin, and is so near the surface that it has broken through from above.

While in the caves of western Europe there are found plentiful remains of the men of the late Ice Age, those showing the typical Paleolithic culture, the region of the Carso is singularly barren in artifacts of these early times. Neolithic remains are everywhere abundant, and in certain places the history of the entire Bronze culture, from the earliest essays at shaping copper to the time of the introduction of iron and later, may be read as a continuous history; but there fails thus far all definite proof that Paleolithic man ever actually lived in this part of Europe. There is in the museum at Trieste, it is true, a cave-bear skull, found in a cave in Nabresina, and bearing over the right temple a broken bone, but the healing of the bone over this spot shows definitely that the accident had occurred long before the death of the animal, and we have no idea of the land where this blow, directed by human intelligence, struck home. The bear was a large one, and it is quite possible that he had become acquainted with the strength and cunning of men in France or Spain years before his peaceful ending near Trieste.

Thus far, in the study of both eaves and rock shelters, we have considered only those spots where the ceilings are high enough to allow men to live and engage in the various activities of life. There are also to be considered the numerous low passages that serve as catch-basins for surface water, or as sewers through which water may flow, bringing with it whatever objects may be brought, mainly bones, and sealing them up in clay in the deeper hollows. The spot near Düsseldorf, in Germany, from which the famous Neanderthal skeleton was taken, was of

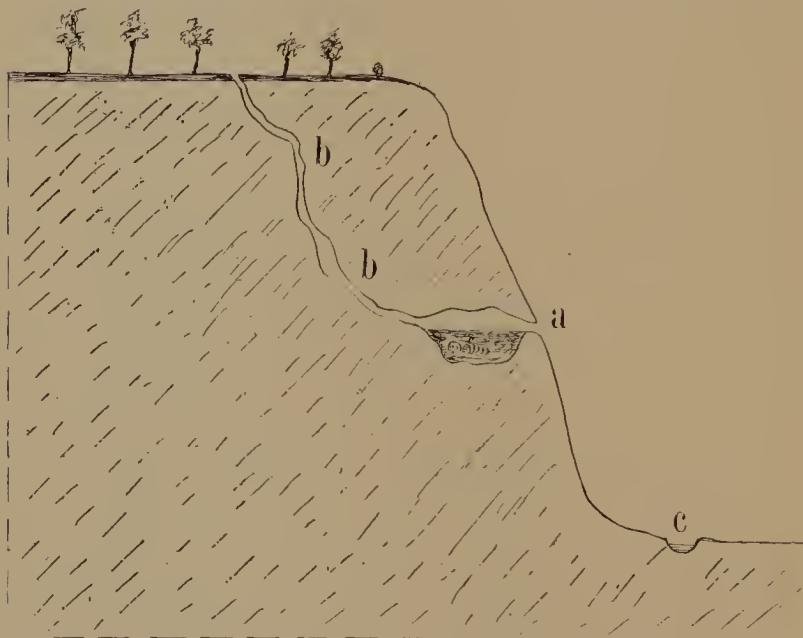


Fig. 9.—Section of the Neanderthal cave. The mouth (a) lies in the steep side of a deep ravine 60 feet above the present level of the river, and 100 feet below the upper level. The cave was probably filled mainly as a result of flooding from the river at a time when this latter stood at about the level of the mouth, although surface leaves and other debris have undoubtedly been introduced also through the fissure (b). The river is now at (c). The proportions of this grotto, and of the fissure leading to it are much exaggerated; otherwise, if drawn in the true proportions, the fissure would look like a mere line. (After Lyell.)

this latter type, and consisted of a narrow fissure, communicating both with the surface of an upper level, and with the side of a ravine near by, some hundred feet or so above the little stream of the Düssel, running along the bottom. At the time when this river, which has undoubtedly been responsible for the excavation of the entire ravine, was at the level of the opening now found high up on its side, several bones of bear and rhinoceros were washed in, either from above, or more likely by being washed in at the lower opening at the time of some high water. Ultimately these bones became securely buried, either by the washing in of sand from the river, or of dust and dead leaves down through the upper opening, and as the river deepened continuously, there eventually must have come a time after which the river could never again, even with the highest water, invade the little fissure, and the bones were left in peace. This cavern, from its size and position, could never have been used as the home of early man, and must be regarded rather as a crypt, in which the bones, by the merest chance, found a burial at the hands of natural forces. So small that it evaded, not only exploration, but even discovery, the fissure with its precious contents was brought to light by workmen in 1857, who were digging out material for constructing a road, and as this practical work was continued then and later, there is now left no trace of the site.

Somewhat akin to a natural crypt, where human bones and other remains may be unintentionally buried, is the intentional use of a small cave, or a small recess in a cave, as a place for interment. Cave burials among primitive peoples are by no means uncommon, and thus it was

no unusual thing for a sheik like Abraham to purchase a cave to serve as a burial place for his wife Sarah and himself. A typical Paleolithic cave burial was unearthed in southern France in 1852, but as the time of discovery was before the true significance of the facts had been learned, little benefit came from the excavation. A work-

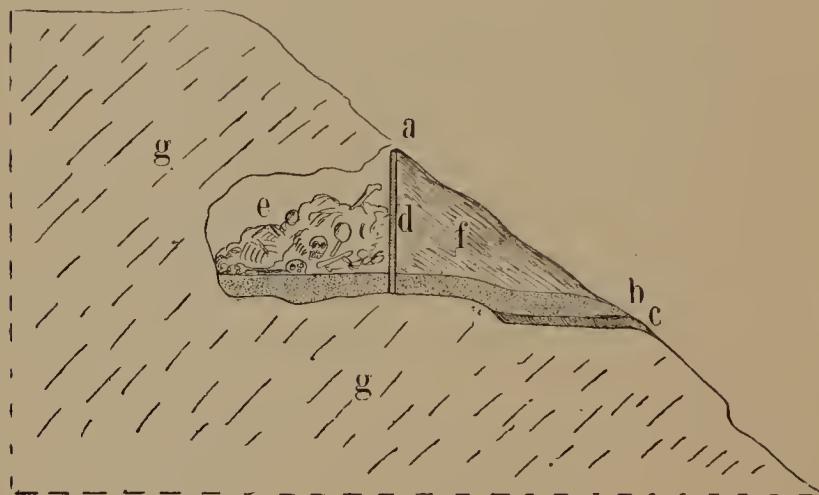


Fig. 10.—Diagram of the famous rabbit burrow at Aurignac. (a), the opening of the rabbit burrow that led to the discovery; (b), the culture layer, 2 feet thick. This is a bone breccia, filled with the bones of animals used for food, and containing worked flints; (c) layers of ashes and charcoal at the mouth of the cave, and wholly outside of the slab. This contains also animal bones, cooking-stones, and other artifacts. (d), slab placed to cover the mouth of the cave, and set through the culture-layer (b); (e), heap of seventeen human skeletons, interred in the grotto; (f), talus, washed down from the top soil above the grotto, and entirely filling in the angle between the slab and the shelf; (g), the bed rock of the region, a nummulitic limestone. (After Lyell.)

man, pursuing a rabbit, followed it to the mouth of its burrow, where the animal disappeared. The man, reaching in his hand, drew forth, not the rabbit, but a human bone. This led to an excavation, which revealed the conditions shown in the diagram. The limits of the original cavern are shown by the irregular line bounding

the bed rock, a nummelitic limestone (gg). There was formed a covered grotto, outside of which was an open shelf, without roof, overlooking the ravine. That this site, so suitable as a home for early man, must have long been used as such, is shown by the two culture deposits, *b* and *c*, which rest upon the original floor. Layer *c*, six inches in thickness, consists largely of ashes and charcoal, interspersed with the gnawed and split bones of both extinct and recent mammals, as well as many hearth-stones, and other artifacts; the whole showing definitely that the fire was always kindled in the open part, before the mouth of the cave. Above this, and spread quite evenly over both open and covered portions, is a second culture layer, two feet in thickness, made up of what is usually found in such deposits, the bones of animals, many artifacts, and a few human bone fragments, strongly suggestive of cannibalism.

After a long period of such occupancy the grotto was finally used as a place of interment. The mouth was sealed up by the slab *d*, evidently a precaution against the depredation of hyenas, the marks of whose teeth were found on the bones outside the slab. Within, forming the mass *e*, entirely distinct from the layer beneath it, were found seventeen human skeletons, of both sexes and all ages. Unfortunately the time of discovery was too early for profitable study, and after a brief inspection, the bones, at the mandate of the mayor of the town, were all reinterred in the parish cemetery!

[†]14. *Kitchen-Middens*.—These are the refuse heaps accumulated by primitive people through the ordinary activities of life. They naturally consist mainly of the

refuse from food, but in part also of broken pottery, rejected implements, and occasionally some more valuable object, accidentally lost. Ordinarily the accumulated garbage is mainly of a perishable nature; such heaps simply add a little to the soil, and through repeated rains and snows, may become entirely leveled and inconspicuous. When, however, such heaps occur along the seashore, where the diet consists largely of oysters, clams, or other mollusks, the vast accumulations of shells form bulky deposits of a permanent nature, the so-called "shell-mounds." The classical territory where these were first carefully studied is along the shores of the Danish peninsula with its accompanying islands, but shell-mounds are very widely distributed—for example, along the entire coast-line of both Americas, from Canada to Tierra del Fuego. The Danish shell-mounds, to which the term "*Kjökken-möddinger*" (kitchen-middens) was first applied, consist largely of oyster shells, and form deposits of many feet in thickness, the oldest deposit being naturally at the bottom. These shells are interspersed with the bones and teeth of the animals that served as food, pieces of primitive pottery, and many stone implements, mainly of types intermediate between the cruder sort with rough surfaces, and the smooth types of later times, *paleoliths* and *neoliths* respectively.¹

The American shell-mounds show every indication of having been the work of the present race of Indians, although the absence of all possible objects of European

¹The best collection of objects from the Danish *kjökken-möddinger* is that in the Danish National Museum at Copenhagen, and represents that successive labors of several noted curators, Thomsen, Worsaae, and Sophus Müller.

origin or influence, such as iron or glass, as well as the presence of the remains of animals now extinct or banished to other regions, e. g., the great auk and the polar bear, show them to be for the most part ancient, or at least precolumbian. As everywhere in such deposits,



A



KJOEKKEN MOEDDING

B

Fig. 11.—Illustrations from Jeffries Wyman's classical article, "An Account of Some Kjoekkenmoedings, or Shell-heaps, in Maine and Massachusetts."
 (a) View of Crouch's Cove on Lower Goose Island, Casco Bay, Maine, where important early work on American shell heaps was done.
 (b) Wyman's party excavating at the spot shown in (a) during the summer of 1867. (After Wyman, in *American Naturalist*, Vol. 1, 1868.)

the contents of these shell-mounds are highly instructive, and a large collection contains practically all the more durable objects connected with the daily life of the people that accumulated them. The first scientific study of American shell-mounds, aside from some desultory examinations, was done by Professor Jeffries Wyman, of Harvard University, during the summer of 1867. Wyman excavated mounds on Mt. Desert Island, Maine, and on Lower Goose Island in Casco Bay, in the same state, also made further study at Eagle Hill, Ipswich, Mass.

In Casco Bay sites there have been found great quantities of the bones of moose, deer, bear, seal, raccoon, skunk and dog, many species of birds, one of which, commonly found, is the great auk, fragments of land turtles, and the remains of all the local fishes, including the sturgeon and halibut, as well as others not usually used as food. The pottery found, although frequent, consists almost wholly of badly broken fragments of small size, although in a few cases a sufficient number of pieces has been found to make a reconstruction possible. These prove to be mostly in the form of large kettles so shaped that they could be hung over a fire, and were undoubtedly used as cooking pots. Many of the shards are decorated with patterns, marked in the clay when soft, consisting of parallel and cross lines of simple geometric designs.

As in the Danish mounds, stone implements, both broken and entire, are frequent, and consist not only of tools, such as axes and gouges, and of weapons, like hatchets and arrow points, but include also those indicative of the lighter side of life, as ornaments of

various sorts, and objects probably ceremonial, and used in their worship.¹

Corresponding to the distribution of the present molluscan fauna, the bulk of such a deposit is composed of the shells of the commonest local species; soft-shelled clams in Casco Bay, hard-shelled clams (quahogs) in some other places, and oysters in New Jersey. The extensive shell-mounds along the shores of the Chesapeake often cover several acres in a continuous formation, and may reach a depth of twenty feet. A single mound of gigantic proportions lies about the mouth of the Damariscotta River in Maine, and forms a mass estimated to contain eight million cubic feet, wholly of oyster shells. This enormous mound may be explained on the hypothesis that this point was for a long time a gathering place for an entire tribe, who at certain seasons of the year, undoubtedly in summer, resorted to the coast for the express purpose of eating these mollusks.

In the bottom of shell-mounds, human skeletons, although infrequent, occasionally occur, pointing to either a hasty interment, or to one occurring in winter, when the ground was frozen. Considering, however, the many indications that these mounds are the remains of summer camps, such as the lack of any indications of the

¹ The classic paper on Indian shell-mounds in America is that of Jeffries Wyman, "An Account of some Kjoekken-moeddings, or shell-heaps, in Maine and Massachusetts," *American Nat.*, Vol. I, January, 1868, pp. 561-584. Wyman's principal site was at Crouch's Cave, Lower Goose Island, in Casco Bay, Me.; and in the summer of 1911 an expedition from Amherst College, under the leadership of Professor Frederick B. Loomis, dug through many shell-heaps in the same region, bringing back a large collection of objects, throwing much light on the former activities of the Indians in these parts. This collection is now in the Gilbert Museum at Amherst.

more permanent dwellings, which the Indians knew well how to make, we cannot seriously believe much in the frozen-soil theory, and look for some more plausible hypothesis.

15. *Remains of Houses and Hearths.*—As pointed out above, in the discussion of objects introduced into a deposit foreign to them, each sort of deposit has a definite structure, the result of the action of the forces leading to its formation, and thus if a piece of ground, where two or more deposits are mixed, be examined in section, the relation of the separate elements becomes apparent. The construction of a hut or other structure that involves any disturbance of the soil, such as the driving in of a stake or post, may produce a permanent derangement, easily revealed by a careful excavator. In this way, through simply digging a series of parallel trenches, and studying the sections thus made, the remains of primitive structures may be brought to light, although no stone or other lasting material may have been used in their construction, and although there may be neither elevation nor depression to mark the site. A post driven into the soil and left to rot in place will often leave a mass of dark loam to replace its subterranean portion, which, in a light sandy soil, or other contrasting material, will be very conspicuous in a smooth section. Even a pit or excavation, filled in subsequently by washings from the surface, and brought up to the general level, will often record its exact shape and size in section by revealing the difference between the earth washed in and that of the undisturbed soil in which the pit was originally dug.

Fig. 12 shows sketches of the excavation of a Neo-

lithic manor-house, or communal farmstead, upon the plain near Stützheim, Germany. The figure on the left is the ground plan, the several figures on the right are successive cross-sections through the soil along the planes indicated on the ground plan.

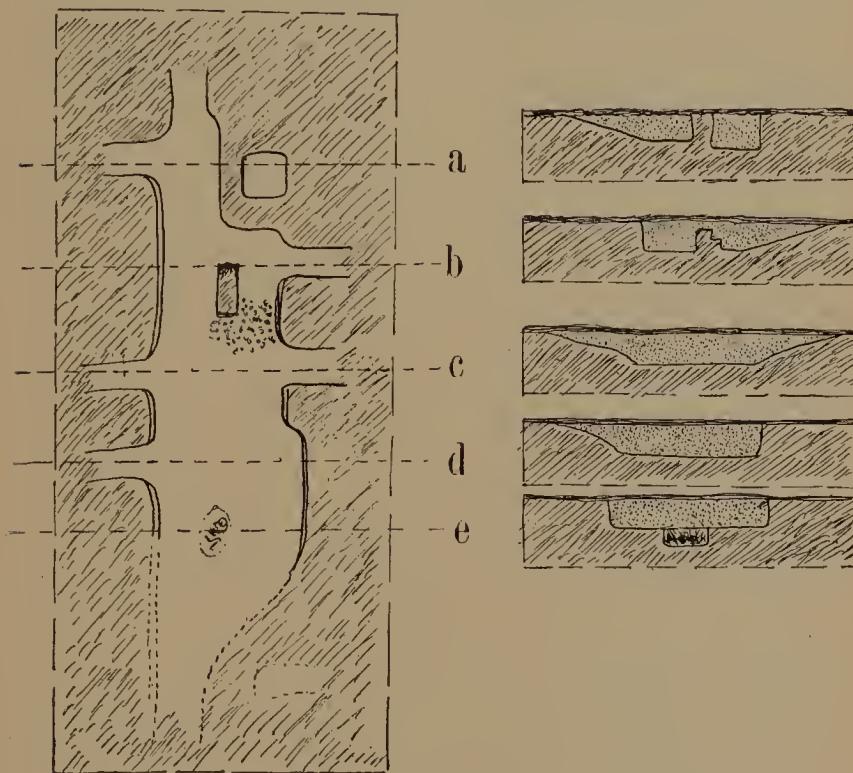


Fig. 12.—A neolithic farmstead; ground plan and sections. (After Forrer, modified.)

The floor of the structure was sunken below the surface level, and the house must have been built with low walls and sloping roof in some way not shown in the excavation. There were seven entrances, one at either end (west and east), three upon the south and two upon

the north. Section *a* is cut through a lateral entrance, also through an isolated pit, serving doubtless as a granary or storehouse; *b* passes through an elevated bench or seat, formed simply by leaving the natural earth in place, when the original excavation for the floor of the main room took place. This seat is placed in close proximity to the fireplace, here indicated by the pile of debris (kitchen-midden) that has collected about it, and the coals of the fire. This spot must have literally formed the *focus* or hearth, for concentrating the family life during the winter months. The same section cuts through an entrance on the north. Section *c* cuts through two entrances, placed opposite each other, and forming a passage quite through the middle of the house, while section *d* cuts through a third entrance on the south side. At *e* a grave was met with, excavated in the floor, pointing to a death during the winter, when the soil was frozen too hard to allow digging outside.

It is to be noted that this entire structure, so eloquent of early conditions, and furnishing so much detail, was indicated solely by the arrangement of the different kinds of soil, and with the exception of the skeleton and the kitchen-midden, contained no culture objects. Anything but the most careful digging, with the separate cross-sections finished by shaving down the sides of each trench with a mason's trowel or large knife, would have given nothing whatever of the house or the proper relation of the kitchen-midden or the skeleton. The method is similar to that used by morphologists with serial sections through some small animal, and can be expected to yield as much as the separate sections can be made to reveal.

House sites practically always display a definite place for the hearth, as indicated by ashes and pieces of charcoal, both substances practically imperishable when once imbedded in undisturbed soil; frequently, too, there are definite associated structures, such as a layer or rampart of partially baked clay, originally intended to confine the fire within its proper limits. Often, in association with the traces of a hearth fire, occur numerous fire-stones, small boulders of the size of the fist or a little larger, which were first heated in the fire and then suddenly plunged into a vessel containing water, thus bringing the latter to a boil by imparting their heat to it. This is the method employed even today among primitive people in cooking meat, and is naturally the only practical method among a people unable to make a water-container that will stand direct exposure to a fire placed beneath it. The receptacle in which the meat is boiled by means of fire-stones may consist merely of a hollow in the ground, lined with clay or with the skin of a beast, both expedients being resorted to among the American Indians, at the time of the early European explorers.

The simple presence of charcoal, unattended by other signs of human activity, must be disregarded as probably the result of spontaneous forest fires, which may be kindled in a variety of ways in which man is not involved; but localized traces of fire in direct connection either with fire-pits, fire-stones, a clay circle, or the remains of feasts, speak definitely of a fire built and used purposely, by man, technically, a *hearth*. Such hearths may be either the definitely localized areas found in association with house sites, or the more diffuse layers

occurring at the mouth of caverns; they also occur in the form of *fire-pits*. These consist of inverted cones of partly burnt clay mixed with charcoal, about a foot in diameter and perhaps twice as deep. They were originally pits sunk in the earth, in the bottom of which a fire could be kindled and kept for a long time, thus shielded from the wind. Precisely similar fire-pits are employed at the present day by gangs of Italian workmen, when working on the highways and on railroads, at some distance from suitable houses.

16. *Tree Houses and Lake Dwellings.*—Primitive people, living in a wilderness unmodified by human influence, are exposed to the constant menace of wild beasts, or of still more dreaded human marauders, far more than may be readily understood by civilized modern people. They are thus led of necessity to take numerous precautions against an unforeseen attack, and strive especially to guard their dwellings against surprise. A frequent expedient is that of constructing a hut high up in the trees, selecting especially for that purpose those that are without lower limbs, and using for ingress and egress a light ladder that can be pulled up at night. Such dwellings are still in use in many parts of the world, notably Papua, and it is altogether probable that similar structures have been made in the remote past. Of these, from the nature of the case, no remains would be left, save, perhaps, an accumulation at the base of the tree resembling a kitchen-midden. Such a heap, found upon or immediately beneath the surface, and entirely isolated from cultural surroundings, would appear as a phenomenon difficult to explain, except in cases where a multiplicity of such isolated



Fig. 13.—A tree-house in British New Guinea. (After Schurz.)

heaps would suggest the former existence of an entire village, propped up on trees.

A step beyond such a tree-village is presented by the erection of such dwellings upon artificially placed trunks or piles, driven into the mud along the shallow margins of lakes, where the inhabitants can not only obtain the security of a position high above the surface of the ground, but also gain the additional advantage of a constant supply of fresh fish, easily obtained by fishing from the house itself. As the piles are all artificially placed, they may be grouped together in some definite plan, and connected by wide platforms, converting the entire village into a communal house or compound.

Instances of various stages, illustrating the growth of the idea, and its adaptation to special circumstances, are seen to-day among primitive peoples, a marked example of which is met with among the aborigines of the north-eastern coast of South America, from which the early Spanish explorers named the region "Venezuela," *i.e.*, little Venice. Here, as usually, numerous single houses are built in close proximity to one another, and are connected by common platforms, the whole forming an extensive pile village extending out into the water, and capable of complete isolation from the shore.

During the development of man in Central Europe similar pile villages ("Pfahlbauten," "Palafittes") played an important part, especially along the shores of the Alpine lakes, and these sites form one of the richest treasure houses of prehistoric objects known to the world. Here, in those spots which offer a shelving shore and a considerable layer of soft mud, men have lived continuously for hundreds, and in some cases thou-

sands of years. During all this time the bones and other solid refuse from their tables, broken tools and utensils, articles of value, unintentionally lost, and all such remains of an active existence, were continually falling from the houses and platforms into the water, and were sealed up in the deep mud, from which they are now recovered, often in considerable profusion. Occasionally, also, the bones of the inhabitants themselves are brought to light, indicative perhaps of some accident in which a body sank into the mud and was not recovered.



Fig. 14.—Reconstruction of a village of lake dwellings on the Lake of Zurich, based upon the actual remains. (After Forrer.)

Aside from all such objects, the piles themselves, or the larger part of them, are often preserved, as well as portions of the superstructures, and from these it is possible to make out the essential details of the houses, at least these of certain periods. In all such reconstructions comparisons with the pile dwellings of modern times are of great assistance, since similar needs and

conditions are productive of similar results, often even to considerable detail, and the life of the lake dwellers of the present cannot fail to have much in common with that of people who lived in the same way in the remote past.



Fig. 15.—Reconstruction of two huts of the Swiss lake-dwellers, showing details.
(After Forrer.)

Perhaps the most important prehistoric pile villages, at least those most carefully studied, are those of the Swiss lakes, where nearly two hundred distinct villages have been investigated. The greatest number of these occur on the lakes of Constance, Geneva, Zürich, Biel and Neuchâtel. Other lakes also have yielded important results, and the museums of Switzerland and Northern Italy are filled with the objects excavated.¹

Pile villages in a somewhat modified form were also developed in certain of the larger rivers, e. g., the Rhine, where an island was used as the center of the village,

¹ Notable in this respect are the collections in Zürich (Antiquarisches Museum); Neuchâtel (Musée des Beaux Arts); and Bologna (Museo Civico).

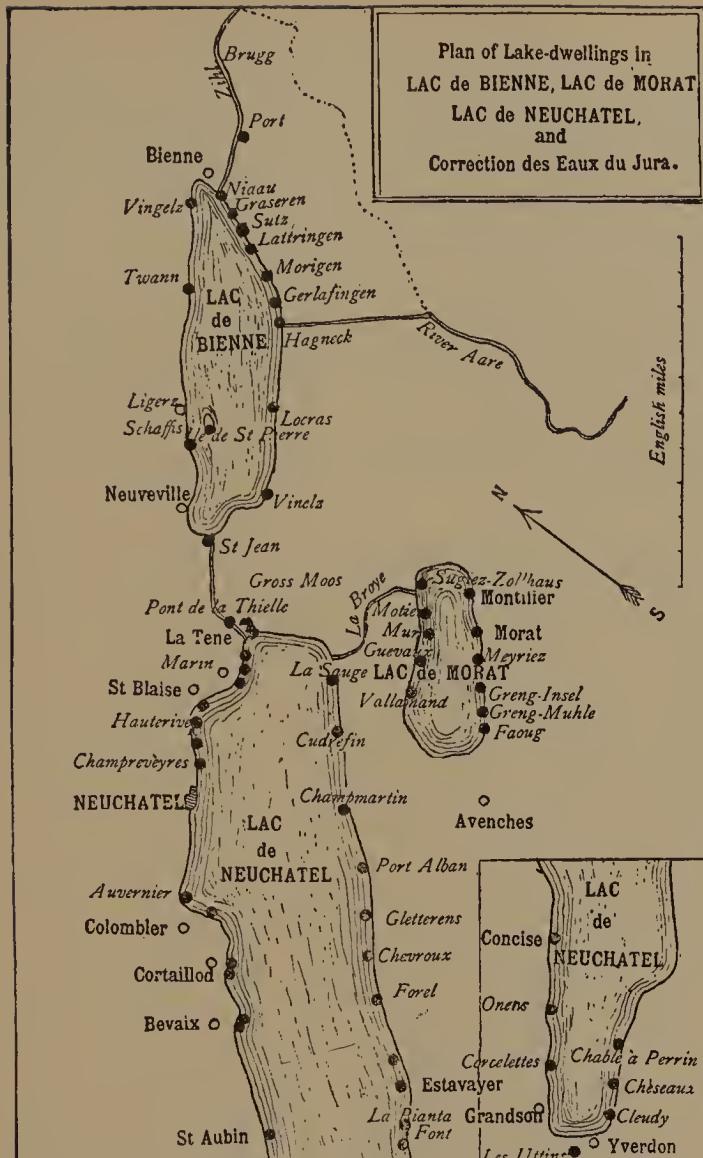


Fig. 16.—Sketch map of the Lakes of Neuchatel and Biel, Switzerland, showing the sites of lake villages. These belong to several periods, extending from the late Neolithic, through the Bronze and early Iron Ages. The site of La Tene, the scene of an unrecorded battle between the natives and the Romans, gives its name to one of the periods of the early Iron Age. The others, for the most part, are older. (After Munro.)

and became extended over the surrounding shallows by means of piles. The famous island in the Seine known as La Cité and forming the heart of Paris, was originally the center of the small Gallic tribe of the Parisii, probably once a similar structure.

Somewhat similar to fixed villages on islands, especially when the habitable area is increased by extension of the structure on piles, are the *floating villages*, with a substructure formed of tree-trunks, not driven down into the mud, but laid out over the water, the whole forming a huge raft, capable of moving about. Such floating villages naturally yield artifacts identical with those from stationary villages, but more scattered, and the former existence of such floating villages has been established from such remains. One of these is thought to have once existed in the river Meuse, near Maestricht; and in the Maglemoos, an extensive moor on the island of Seeland, in Denmark, which must have once been a lake, the remains of just such a raft were found imbedded in the peat, and thus preserved. Associated with this raft were found many thousand artifacts of stone and bone, also teeth of the elk and urus, all characteristics of the lake-dweller type of culture.

While the lake dwellers of Western Europe, including those of Switzerland and Italy, were prehistoric, a certain few of their villages, mainly Swiss, were still occupied when the land was first explored by the Romans, and in other countries, notably about the Black Sea, several Greek travelers have studied and described them. Hippocrates thus describes the people of the Phasis, a marshy region at the eastern end of the Black Sea:

“Concerning the people of the Phasis, that region is marshy and hot, and full of water, and woody; and at every season frequent and violent rains fall there. The inhabitants live in the marshes, and have houses of timber and reeds constructed in the midst of the waters and they seldom go out to the city or the market, but sail up and down in boats made of a single tree-trunk, for there are numerous canals in that region. The water they drink is hot and stagnant, putrefied by the sun, and swollen by the rainfall, and the Phasis itself is the most stagnant and quiet-flowing of all rivers.”¹

Herodotus made his observations upon the lake dwellers of Lake Prasias in Rumelia, near the mouth of the Strymon. He says:

“Their manner of living is the following: Platforms supported upon tall piles stand in the middle of the lake, which are approached from the land by a single narrow bridge. At the first the piles which bear up the platform were fixed in their places by the whole body of the citizens; but since that time the custom which prevails about fixing them is this: they are brought from a hill called Orbalus, and every man drives in three for each wife that he marries. Now the men have all many wives apiece, and this is the way in which they live. Each has his own hut wherein he dwells, upon one of the platforms, and each has also a trap-door, giving access to the lake beneath; and their wont is to tie their baby children by the foot with a string, to save them from rolling into the water. They feed their horses and their other beasts on fish, which abound in the lake to such a degree that a man has only to open his trap-door and to let down a basket by a rope into the water, and there to wait a very short time, when up he draws it quite full of them.”

17. *Crannogs*.—A form of refuge, often made use of

¹This and the following quotation are taken from Robert Munro, in his “Lake-Dwellings of Europe,” London, 1890, p. 553.

by a primitive people in time of great tribal danger, is that afforded by an island of firm ground situated in the midst of a great marsh or swamp, and reached only with extreme difficulty. Such a spot is usually strengthened by some artificial fortification, such as a palisade, and if the ground be not high enough of itself above the water level, the structures built upon it are raised on piles, as in lake dwellings, or the ground is built up by stones and logs.

Such swamp refuges occur in perhaps their most typical form in Ireland and Scotland, and bear the name of *crannog*; they seem to have played an important role during the early development of the Irish people, perhaps in the case both of the Iberian aborigines, and their later Celtic invaders, and were used for purposes of defense well into the Middle Ages.¹

The *crannog* means of defense was resorted to in southern New England by the Narragansett Indians in their last hold against the English invaders, in 1675. This entire tribe, after suffering sufficiently at the hands of the English to convince them of the great superiority of their enemies, betook themselves to an island in the midst of "an hideous swamp" in South Kingston, R. I., and surrounded the bit of firm ground with a palisade of logs. The English waited until the cold of the winter converted the water to ice, thus making the swamp passable, and then stormed the fort, slaying with sword

¹ Munro (*loc. cit.*) enumerates 103 *crannogs* in Scotland, and 145 in Ireland. Of the former, 56 were constructed wholly, or in part, of wood, forming huge rafts, or artificial islands, in the swamps. Many of them show Roman contact, and proof that they were used as late as the seventh century of our era. In certain of the Irish *crannogs* were found coins of the three Edwards.

and fire the entire tribe, men, women and children, so far as they were able. This disastrous result showed that while retirement into a crannog may be a fairly secure manner of defense against an enemy of about the same degree of development it is the worst possible tactics against a superior foe, since by concentrating a tribe into a single spot, it makes a complete extermination possible.

To the prehistorian, however, it is this very concentration that renders a crannog especially valuable. As a last stronghold of a tribe, there are collected there their most cherished possessions, and those that are not of a perishable nature, and are overlooked or trodden into the soil in the heat of victory, remain indefinitely in a very restricted area, awaiting the spade of the excavator. Thus "from the Crannogs at Dunshauglin more than one hundred and fifty cart-loads of bones were obtained and used as manure."¹ These were, course, mainly or wholly those of the animals that served as food, showing that a crannog is practically a strictly localized kitchen-midden. Great numbers of objects of stone and bronze, as well as of bone and horn, have been collected.

Aside from crannogs of British origin, quite typical crannogs are found in various parts of the continent. Thus, in northern Italy (Parma, Modena, Emilia) they are known as *terremare*, and in the peninsula of Istria, at the upper end of the Adriatic Sea, they are called *castelliere* or *pizzughi*. Many of these have already yielded much material.

¹ Lord Avebury, "Prehistoric Times," 6th edition, 1802, p. 169.

18. *Forts and Scharrachs*.—Aside from crannogs, the occurrence of which is naturally restricted to a few definite regions, the necessities of defense have developed during prehistoric times numerous artificial structures which, when sufficiently extensive to change the surface of the soil, remain to the present day.

Thus there occur, in various parts of Europe, extensive structures associated with hills, or from whose heights they bid defiance. In their simpler form they consist of a ring wall or enclosure, usually an earth-work, but often reinforced by stone. More complicated structures may enclose an entire hill, and include ramparts, moats, terraces and mounds, as though forming the foundation for a complete aeropolis, the material for which was largely of wood, and hence has long since disappeared. Sometimes a natural hill has been reshaped through extensive grading into the form seen at present; in cases, too, the entire hill is an artificial one, and must have been due to the efforts of the whole tribe, working for a long time.

Owing to the lack of historical perspective in the popular mind, these works, in every country where such occur, are attributed to some great struggle between peoples with which the present inhabitants are traditionally acquainted, and the names commonly applied make some allusion to historic peoples. Thus, a structure of this sort in Alsace is known as the "Swedish rampart"; one in Hungary is the "Turkish fortress," and so on. In other cases the names suggest popular mythology, like the "fairy rings" and "fairy fortresses" in Ireland, while in matter-of-fact England the people content themselves with calling them "rings" or "cas-

ties' like Cissbury Ring, Maumbry Ring, Maiden Castle, and the like.

As collective names for all such structures, which, it is needless to say, are prehistoric, and are of Bronze Age origin at the latest, the German archeologists apply the term *Wallburg* (*i.e.*, foreign fortress, the word Wall being the same as that met with in *Wall-nuss*, *Wall-fisch*, etc., and meaning foreign or "welsch"). In Bohemia,



Fig. 17.—Landscape, showing an extensive scharroch, near Stronegg, in Lower Austria. This particular structure is known locally as the "Hausberg," perhaps preserving in the name the memory of its former use as a habitation. (After Forrer.)

where 166 of these structures have already been identified,¹ they are called *Hradiste* (from *Hrad*, or *Grád*, a city or citadel. Cf. *Petro-grad*). There is also the Celtic term *scharrach*, which is occasionally found as the local name for certain specific cases, and which is commonly used by the British and American writers, who employ Celtic terms for prehistoric structures in

¹ Woldrich, in *Mitt. Anthropol. Gesell.* Wein XXIII, 1883, pp. 1-38.

general. The persistency of this word in places outside of Britain is seen in the popular designation of one of the great examples of such a structure in Alsace, the "Scharrachburg."

Scharrachs vary in size from insignificant mounds to complex citadels, with walls and moats, ramparts, slopes, and terraces. Some of them are plainly built for the purpose of defense, or of enduring a siege; others are so extensive that there never could have been men enough to serve as defenders of the entire place at once, suggesting the structure as organized for defense, not against the concerted action of men, but against the lesser cunning of wild beasts, presumably wolves. In position some occupy heights among masses of hills; some rise from the plain; and some are placed within a loop of a river. Certain of the European scharrachs reach back well into the Age of Stone (Neolithic), as may be proven by the associated artifacts; others are mainly or wholly associated with the Age of Bronze. In a few cases, as with the crannogs, scharrachs may come into recorded history, and are remembered in authentic traditions, as in the case of the "Danevirke" near Kiel, which are known to have been inhabited in the eighth and ninth centuries of our era.

In the eastern United States the early pioneers record the position of numerous Indian villages, and allude to them as "forts." These were collections of the native huts or tents, surrounded by a palisade of logs, placed upright in the ground. Where the palisade was placed upon an earth embankment the latter would be left after the decay of the wood, and present an appearance something like the "rings" found in Europe; where there

had been no such embankment, there would be either a slight ridge resulting from the decay of the wood, or not even that, and the "fort" would disappear, leaving no trace.

In other cases, as with the European scharrachs, more or less stone was used, or incorporated, in the construction, and the remains would have a proportional amount of permanence. Thus the "Queen's Fort" in southern Rhode Island, between North Kingstown and Exeter, and associated with the sunck-squaw, or "Queen," Quaiapin, is an irregular enclosure, built upon a rocky hill, or natural pile of rocks. It has a perimeter of nearly eight hundred feet, and is furnished with three bastions, or extended angles, to guard the approaches to the walls. This was one of the main strongholds of the Narragansetts during their wars with the English settlers about 1675, and may easily have had a history in intertribal conflicts long previous to this date.

Among the numerous earthworks of Ohio and Wisconsin, there are many structures which are complicated in design and somewhat suggest certain of the systems of terraces, ramparts, and other earthen structures of prehistoric Europe, and like them suggest an acropolis or metropolitan center. Such a one is the extensive system of works upon which the modern city of Marietta is built, which once consisted of mounds, raised parallel ramparts, and, most remarkable of all, several rectangular platforms of large size, which look as if they had once been the foundations for extensive buildings, probably temples. These were definitely connected in plan with the ramparts, roads and terraces, the whole covering the surface of a plain along the Muskingum River,

fully a mile in length. The construction of the modern buildings has destroyed the larger part of the original earthworks and effectively concealed the original plan, but one of the best of the rectangular platforms has been retained by erecting upon it the new library building.



Fig. 18.—View of Marietta, Ohio, at the time of settlement in 1780. A hasty sketch taken from an old painting preserved in the Historical Society Collection of Marietta College. Squier and Davis present a lithograph of virtually the same picture opposite p. 139 of their great work, "Ancient Monuments of the Mississippi Valley," but in this latter a few unimportant details, e.g., the dead tree in the foreground, differ a little. In the original condition the earthworks included several isolated mounds, two large square enclosures, with temple sites, and a "sacra via," consisting of two long parallel ridges, defining a sunken way. The greater part of this extensive system coincides with the residence part of the city of Marietta, and the earthworks are nearly obliterated, but the large mound the farthest away from the spectator in this painting lies within the modern city cemetery, and is provided with a flight of steps and a railing on the top. A new city library has just been erected on one of the temple mounds within the larger square.

19. *Cornfields, Dewponds and Cattle-ways.*—Not only are subterraneous disturbances of the soil frequently recorded and the records preserved with great fidelity, but changes made on the surface by human activity may be equally permanent, provided that in the meantime

nothing occurs to destroy the record. The blowing of a wind across an exposed plain of sand may obliterate the footprints of a passer-by in an hour's time, but similar footprints, left on the floor of a chamber in a cave by the one who pushed into place the boulder that sealed it, may remain distinct for a hundred thousand years. The lava from Vesuvius, flowing over the surface of the gardens of the Pompeian villas, has preserved not only the flower-pots which once held flowers, but the roots and stalks of the flowers themselves, so that now, after nineteen centuries, the plants may be replaced in a restored garden, kind for kind.

While the above illustrations of the persistence of surface activities are admittedly unusual ones, dealing with extreme cases, the preserving power of a carpet of turf spread over an exposed surface is also very great, and the slight sculpturing of the surface in cultivating the soil, or even that produced by the wearing of paths, or the construction of simple roads, when once covered with verdure, and thus protected from winds and rains, is likely to remain for centuries in about its original condition.

As an illustration of this may be taken the fields used by the American Indians for the cultivation of maize before the advent of the Europeans with their plowshares. Such fields are found still, even in the more cultivated parts of New England, where for one cause or another the original surface has been left for the few hundreds of years that separate us from the aborigines, and here the remains are frequently in so permanent a condition that the lapse of as many thousands of years as it now is hundreds would leave the surface unehanged.



Fig. 19.—Remains of an aboriginal cornfield in Northampton, Mass. The mounds are made separately, placed in rows in one direction but not in the other, and evidently were made to last from year to year, cultivation being started each spring in each mound. There was no plowing, or any process that resembled it. In the deed of May, 1664, between the Indians and John Pynchon, et al., by which the adjacent village and the surrounding country were sold to the Englishmen, it was expressly stipulated that the Indians should remove at once to the other side of the Connecticut, where the English should plow up for them sixteen acres of land for corn planting, but that for the present summer (1664) the Indians should keep their own cornfield, as it was then already planted. This gives the exact date for the last cultivation of this field.

In these aboriginal cornfields which antedate the use of the plow, the unit of structure is the single hill, each of which is erected by hand for the nurture of the single plant, or plant association, and which remain year after year in the same place. According to the descriptions of the first European settlers, the surface of each hill was softened up in the early spring, and there were placed in it two or three kernels of "corn" (maize), a bean or two, or occasionally a squash or pumpkin seed, and a fish for fertilization. Otherwise, between the separate hills, nothing seems to have been done, and the natural turf was allowed to grow unmolested. The hills were located in rows, sometimes in one direction only, sometimes opposite the hills of the next row, arranged like the squares of a checkerboard. The quincunx arrangement, where the hills of one row come opposite the intervals of the next, is seldom met with, and on the other hand, a completely irregular arrangement, without rows in either direction, is rather common. Of any attempt at plowing an entire large surface, and the subsequent geometrical arrangement of the hills over a fallow area, there is not the slightest indication. Judging from the settlers' accounts of the first development of a tillage area from the forest, the trees were laboriously felled, and the separate hills established wherever possible between the stumps, leading to the irregular arrangement still often met with, and evidently indicative of a fairly new field. After the decay of the stumps there seems to have been a natural tendency to get the hills into definite rows, and fields with this arrangement probably represent a late stage in the reclamation of a tillage area. Presumably, in reshaping the

hills from year to year there was a tendency to bring up more soil, and the hills in this way eventually formed structures sometimes two feet in height, and large enough at the base to become confluent.

In association with the remains of scharrachs, forts, and other signs of the permanent occupancy of a region for a long time, not only the sites of fields and gardens are frequently to be met with, but there may be other surface indications, such as old roads or streets, paths for men, cattle tracks devised by domestic animals, and so on, remaining for a vast number of centuries. Thus in the downs of southern England, in association with the rings and ramparts, are still to be traced many such surface modifications dating from the Bronze Age, or even the Neolithic. Among these are small circular or square areas a little concave, evidently once "dew ponds," by means of which the inhabitants of these regions solved the problem of the water supply when cut off from the natural watercourses lower down. Such dew ponds, which depend upon the principle of collection and storing the atmospheric moisture, have been used in England up to modern times, and men may still be found who understand their construction.¹

20. *Megalithic Monuments.*—In many parts of the world there occur curiously placed stones, generally of huge dimensions, and hence called megaliths (Gk. μέγας, large; and θεῖος, stone) which in their position and arrangement show a definite purpose, and cannot be

¹ For this topic cf. Hubbard, *Neolithic Dew-Ponds and Cattle-Ways*; Longmans, Green & Co., London, 1916; also E. B. Delabarre and H. H. Wilder, *Indian Corn-Hills in Massachusetts*, *Amer. Anthropol.*, July-Sept., 1920, pp. 203-225.

accounted for as the result of glacial action, or of any other force save the definite design of man. Such stones occur in a great variety of form and arrangement, and everywhere excite the interest, and often the wonder, of the inhabitants, usually not unmixed with superstition.

Typical megaliths are rough and irregular of surface, with no attempt at finish or elaboration of the surface, nor do they usually bear any carving or inscription of any sort; yet, in a way, the elaborate stone structures of the early historic peoples, such as the obelisks, and perhaps the pyramids of Egypt, and the temples of Greece, may be nothing more than the elaboration of these cruder types, by which in arrangement and in general form they were long anticipated.

The simplest type of megalithic structure is the *menhir*,¹ which consists of a single large pillar, standing upright in the earth, with the base deep in the ground. Menhirs are generally of large or gigantic proportions, often many times the height of a man, but are proportionately slender, and form a sort of crude obelisk.²

Menhirs are occasionally met with arranged in one or more rows across a level plain, and constitute what is technically known as an *alignment*. Sometimes, too, they are arranged, not in a straight row, or in several parallel straight rows, but in a circle or oval, the group

¹ Menhir is a Celtic word, from *maen*, a rock, and *hir*, high.

² The tallest menhir known, with a height of twenty and a half meters, is situated in Morbihon, Brittany, and is locally known as the "Men-er-Hroek," or Stone of the Fairies. The others found in the neighborhood are much smaller, measuring between seven and eleven meters. The finished obelisks of Egypt frequently surpass even the menhir of Morbihon, one at Karnak measuring over thirty-three meters.



Fig. 20.—Entrance to the village of Menac, at the head of the Carnac Alignment.
(From a photograph by Miss Agnes Hunt.)

being then known as a *cromlech*¹ or stone circle. Both of these types sometimes occur as elements of a vast structure occupying a space many acres in extent, as in the great megalithic temples of Stonehenge and Carnac, described in Chapter III.

Aside from structures made with single menhirs, either alone or grouped to form rows or circles, there are two distinct types of compound megalithic formations that result from the piling or arranging of several megaliths into a single structure; the *lichaven* or *trilith*, and the *dolmen*.²

The first of these consist of two upright menhirs, set near together, but not in contact, with a third one laid horizontally across the upper ends of the others in the form of an architrave or lintel, forming a great door or gateway. Single triliths may occur; they are also found grouped to form a cromlech or stone circle, like those of Stonehenge.

The second compound type of monolithic structure, the *dolmen*, is essentially a stone table, usually of huge proportions, in which a fairly flat top or roof is placed horizontally on the top of three or more uprights. Dolmens occur in the same regions where other types of megaliths are also found and have been interpreted by some, as in the case of triliths and other megalithic structures, as being the cores, or internal skeleton, of structures once covered with earth, which by erosion has long since been removed.

Megalithic structures of these various types are met with in many parts of the world, but are especially fre-

¹ Cromlech; from Celtic, *kroumm*, curved, and *lech*, a stone.

² Celtic *dol-men*, from *dol* or *daul*, a table; and *maen*, a rock.



FIG. 21.—VIEWS FROM CARNAC, BRITTANY. FROM PHOTOGRAPHS BY MISS C. J. LYNCH. (a) A small menhir, forming part of an alignment, Carnac. (b) Among the menhirs, Carnac. (c) Dolmen, or stone table, supported by uprights. Situated about a mile from the village of Carnac.

quent in France, Denmark, and the British Isles. In France there have been enumerated 4458 dolmens, and 1588 single menhirs, or counting also the menhirs in the various alignments and cromlechs, 6192.¹ These are especially abundant in Brittany, the Department of Morbihan alone possessing 3450 menhirs, more than all the rest of the country. Nearly all of these are made of rough stone, without sign of carving, or more than a slight attempt at a careful shaping, but in a few cases they are fairly symmetrical, and occasionally the surface bears definite carvings (petroglyphs). Since, however, some of these last consist of Christian emblems, e. g., the twelve apostles, the Virgin, etc., definitely of recent date, and since the surfaces of these blocks offer tempting fields for such work it is never certain, even when the petroglyphs are of undoubted antiquity, that they were made at the time the stones were set in place. A striking secondary modification of an ancient megalithic structure is that of a dolmen at Saint-Germaine-de-Confolens, Department Charente, where the four supporting monoliths which chance to have been set approximately at the four corners of a rectangular top piece, have been carved into cylindrical columns with heavy capitals, and the whole dolmen converted into a small chapel.

Wherever such striking structures occur, it is only natural for them to excite wonder and speculation, and become connected in the popular mind with local folklore and tradition. Thus they are variously designated as fairy rocks, fairy homes or tombs, devils' seats or

¹ Figures from various sources, collected and given by Dechelette, 1908.

tables, tombs of the giants, of the Saracens, of the English, of the Huns; beds, chairs and other domestic furniture of Arthur, of Roland, of Gargentua, and so on. The dolmens especially suggest tombs, and are often associated with a long covered gallery leading to the interior. Precisely similar stone structures, forming a genuine tomb-chamber and the passageway leading to it, have been found as the substructure or core of an artificial mound, a circumstance which suggests strongly that the typical dolmens, now standing in the open, were once the cores of similar mounds, subsequently removed through the long continued action of the elements, leaving the stone structures entirely uncovered.

On the other hand, solitary menhirs seem to show no funereal connection, but perhaps may have been memorial stones, marking the site where great events took place, or were somewhat more likely objects of veneration, in which the vivid imagination of prehistoric man could see the form of the divinity which his fingers were as yet too untrained to attempt to carve.

That the impression produced upon the untaught by such huge stone structures is one of veneration, if not actual worship, is shown by the attitude towards them taken by the modern population. After the spread of Christianity over Europe, with its iconoclastic tendency towards sacred trees, and all objects associated with the worship of the northern religion, menhirs and dolmens were frequently overthrown, or were else "Christianized," that is, covered with engraved Christian emblems, surmounted by a cross, and used as wayside shrines. This was plainly the motive in the case of the carved

dolmen, above mentioned, with its sculptured columns.¹

21. *Graves and Burial Places.*—Among the most valuable of all prehistoric remains are places of burial, for here are found, not only the bones of the ancient peoples, with all the possibilities arising from careful anthropometric studies, but frequently also numerous associated objects, placed with and about the dead for ceremonial reasons, and, aside from their intrinsic interest, revealing much concerning early philosophy. Among primitive people the cult of the dead often assumes exaggerated proportions, especially among those that have become sufficiently civilized to allow the construction of elaborate tombs and burial vaults, while at the same time they lack a sufficient breadth of knowledge to place them in a true relation to the larger world. Thus, in the ancient Egyptian civilization, a *necropolis*, or city of the dead, always accompanied each city of the living, and occupied a large share of the attention of the people. Here, and elsewhere, the tomb is the dwelling-place of the occupants, and not only may resemble in architecture the homes of the living inhabitants, but is furnished with the implements and utensils that would be needed if the occupants were still alive. This principle is sometimes carried to such an extent that the favorite domestic animals are buried with the departed chieftain,

¹ W. C. Borlase, in his "The Dolmens of Ireland," 3 vols, 1897, has given an exhaustive review of these structures in that country. The monolithic structures of all sorts, found in Brittany, are pleasantly described by A. S. Packard, in the *American Naturalist* for 1891 (pp 870-890). In the *Scientific American* Supplement for Oct. 8, 1909, are given suggestions concerning the methods employed in transporting and setting up the huge monoliths.

either killed at the grave or entombed alive, and this custom may be continued so as to include the servants, and even the wives. Practically all of these customs are still extant among various primitive living peoples, and repay the most careful study, since through these the psychological meaning of the details obtained by excavation often becomes apparent.

While in many situations and in certain soils human bones are not very durable, and soon vanish completely, in other cases, where the conditions are different, they may last indefinitely, and although they become extremely fragile, still often preserve their exact form, and through the proper means may be removed and hardened.

The simplest form of burial is that in which the body is laid in a slight excavation in direct contact with the earth, without coffin or external protection of any kind save, perhaps, a cloth or hide, or something of an equally perishable nature. Even in such cases, under the right conditions, the bones may last for thousands of years. Thus the plains of the Rhine valley are in places thickly strewn with graves of the Neolithic period, dating perhaps from six to ten thousand years before the Christian era, and yet in many cases the skeletons are still partly preserved and capable of excavation. With these are usually found various sorts of stone implements and pieces of pottery, indicative of the period to which they belong. Skeletons of the Bronze Age also frequently occur, quite similar in appearance to the first, but definitely differentiated from them by the presence of numerous implements of bronze, perhaps a sword and a buckle for the sword belt in the case of a man, and a

comb, a long hair needle, and a brooch in the case of a woman.

The proper excavation of such a grave not only requires considerable technical knowledge in order to realize all the possibilities of the find, but all the surrounding circumstances, such as the surface geology, the condition of the soil, and the arrangement of its layers should be carefully noted. When possible, a trained archeologist should be called at the very beginning of the work, or when there is no such specialist available, the excavation should be done only in the presence of the most scientific men obtainable, who should note the details with care. Thus, with respect to the position of the body, one should find one of the following conditions,

1. Placed horizontally, usually upon the back. The arms may be (a) put upon the chest, (b) laid along the sides, and so on. This is the usual position of burial in a coffin, or when the body is placed in a stone cist or sarcophagus.
2. Folded up, with the knees to the chin, and placed (a) on the side, (b) on the back, (c) on the face.
3. True "sitting position," with the head uppermost.¹
4. Thrust into a pit without system, the limbs bent or folded haphazard.

Many archeologists have sought for some definite symbolic meaning in the various attitudes in which bodies

¹ The so-called "sitting position," in which aboriginal skeletons are almost always reported to have been found, is usually a journalistic phrase, and signifies any folded position, that is, anything except the usual civilized one, with the body "laid out" straight and on the back or side. The actual sitting position, with the vertebral column upright, the hip-bones below, and the skull above, is of rare occurrence, and when found is generally in association with a mound or tomb of some sort. In certain parts of the earth, however, as in Peru, and in some localities of our own Southwest the true sitting position is usual.



Fig. 22a.—Skeleton of an old Indian man found in North Hadley, Mass., shown exactly as in the grave. Note the folded position, suggesting the binding of the body when fresh. The photograph was taken from a camera elevated above the body and looking straight down upon it. The skeleton is therefore not in a sitting position, but folded up, and lying upon the right side. Now in the Museum at Smith College. Prepared by the author.



Fig. 22b.—Skeleton of an Indian man found at Cheapside, near Greenfield, Mass. Manner of photographing, position, etc., the same as in Fig. 22a. Now in the Gilbert Museum at Amherst College. Prepared by Ralph W. Whipple.

are buried, and occasionally this belief is justified. In many cases a folded body was probably tied in this position with the avowed intention of preventing either later visitations from the man himself, or the use of the body by an evil spirit, who might possess himself of it to do harm to the living. Sometimes the face will be found turned to a definite point of the compass, frequently the East, which may very likely have had a religious significance, connected with some form of bodily resurrection. Again, the utilitarian purpose of folding, or even tying the body in order to make the interment easier, was undoubtedly a frequent motive, especially among a primitive race, poorly equipped with tools for digging.

A curious theory, now known to have been due to a misunderstanding of a modern writer, is that the folded body, the *Hockerstellung* of the German archeologists, represented the child in the womb, and that this position was symbolic of a new birth from the Earth-Mother. The study of the ideas and customs of modern peoples still in primitive condition, gives much support to all of the above theories save the last, but shows absolutely no evidence of this particular symbolism.¹

It is always of interest to note the exact relationship of each skeleton to the points of compass, both the direction of the vertebral column, that is, of the body as a whole, and that to which the face is directed, also in each case the sex, so far as determinable from the bones or the associated artifacts. It is true that here the similar

¹ For positions in burial and their significance, in the light of the study of living races, see R. Andrée, in "Archiv für Anthropologie," 1907.

direction of a series of skeletons may have been due merely to convenience or custom, as in old New England "burying grounds" of the seventeenth and eighteenth centuries, but it is precisely in such points that primitive ritual is likely to show itself, and in a given case the absence of definite plan is as important to establish as the reverse.¹

The treatment of the bones, both during and after excavation, depends so largely upon the conditions that no general rules can be followed. In most cases the bones when first exposed are soft and easily crumble to pieces, but if they are carefully exposed for a few hours and allowed to dry out before removal they will become much firmer. In no case should a shovel or other large tool be employed in the final excavation, but the earth should be carefully removed by some small implement like a flat stick or knife, or, best of all, mainly by the fingers. A brush, like a clothes-brush (whisk-broom), is also often useful, and much of the earth can be safely brushed away. In cases where the bones are too fragile for the above treatment, certain special methods may be used, such as impregnating the soil, bones and all, in a glue solution, shellac, or water glass, thus making a fossil of

¹ The custom of burying bodies in rows, with or without mounds to mark the single graves, is so universal in Christian countries that one takes for granted that it is always the custom everywhere. This is, however, no more natural than any other arrangement, and like other methods sometimes appears as a distinct tribal custom. Thus it occurred among certain prehistoric peoples of northern Germany, whose burial places on this account are termed by modern archeologists the *Reihengräber*, and it is a possible hypothesis that this common custom of modern times among European peoples may be traced back to these people, either as a direct inheritance or as the perpetuation of an idea.

the whole mass, which may then be removed in a single piece.

If the bones lie in moist sand, they may be uncovered only enough to locate them; the sand may then be replaced over them and the whole grave may be isolated from the surroundings by digging deep trenches entirely around the body, and in this condition a box may be built about the whole thing. When a bottom has been driven through beneath by pushing boards through, one at a time, the box may be screwed up and transported to the museum or laboratory where the investigator wishes to continue to work. Under such favorable conditions the actual excavation may be carried on, and the most fragile bone, or even a trace of one, may be hardened and fixed by any desired method.

By this method an interment may be preserved in exactly the same condition that it was in the earth when found by the investigator, and at times such details as the settling of parts of the body shortly after death through decay, displacements by the action of worms, moles, or burrowing insects, and so on, may be vividly shown.¹

A series of skeletons of Oscans, discovered a few years ago in Pompeii, beneath the ruins of the Roman city, and antedating them by many hundreds of years, have been left in place, with glass cases built over them, and the whole collection, of some dozen separate graves, enclosed within a building erected for that purpose. In

¹ For details of the method of excavating fragile skeletons, especially the removal of the entire grave, and the subsequent excavations in the museum, see H. H. Wilder and R. W. Whipple, in *American Anthropologist*, July-Sept., 1917, pp. 372-387.

this case a museum was built over a set of graves, since they happened to be found in a place constantly visited by sightseers; otherwise some method might be devised for transporting a grave, earth and all, to a museum.¹

22. *Mounds and Tumuli*.—A common artificial earthen structure, found in almost all parts of the world, is the *mound*, typically conical and symmetrical in shape, and varying in size from that of a corn hill to that of a pretentious structure, slightly in appearance and capable of being used as a lookout or observation post. Mounds, like ramparts, are occasionally erected as part of some elaborate system of defense, and have been already mentioned under the heading of *scharrachs*, but the common purpose of a *mound* is *funereal*, and used as a final abode for the dead. To distinguish such a mound from other types, it may be known as a *tumulus* or *grave-mound*.

The present practice of the disposal of the dead in China well illustrates the formation of grave-mounds. Here there are no burials, in the sense of actual interments, but the coffins, often large and elaborate, are set about anywhere in the fields, often along the base of the city walls, and a temporary roof of sods or tiles is placed upon it for its protection. After some time, months or even years, more sods or earth are heaped

¹ There may here be emphasized, not only the advice given above, that of securing the best specialist obtainable, in the event of the discovery of ancient human bones, but also the importance of eventually placing such remains, correctly labeled as to locality, in the nearest public museum, where they may be permanently kept. In private possession such objects are easily injured, the labels are misplaced, and eventually the total destruction or loss of identity of the entire specimen is inevitable.

up over the original coffin, or over coffin and its temporary shelter, and eventually the original nucleus disappears beneath a pretentious and symmetrical tumulus.

The study of these present-day Chinese mounds prepares us to expect elsewhere as a nucleus human remains, enclosed in some form of shelter, and, as a matter of fact, such is very frequently the case. There are also, especially in regions where cremation has been practiced, plenty of mounds where actual bones are replaced by charred remains, or simply ashes, and in such cases there are likely to be found, associated with the ashes, numerous implements, presumably the possessions of the dead. During the Bronze Age, when incineration was usual, mounds of this period have furnished some of the richest finds of such materials. Occasionally, too, deposits of implements are often found in a mound, without the expected ashes, and it may be supposed that for some reason, either as a cache, or a sacrifice, or as a commemoration, the constructors of the mound intended it primarily to contain the hoard brought to light by modern excavation. We have in *Beowulf* a detailed account of the building of just such a mound, the appearance and contents of which closely correspond to certain ones actually investigated.

“Then the Weder people made a mound upon the cliff—it was high and broad, to be seen of sea-faring men; and ten days they built it, the war’s hero beacon. They made a wall round about the ashes of the fire, even as the wisest of men could most worthily devise it there. Within the mound they put the rings and the jewels, all the adornments which the brave-hearted men had taken from the hoard; they let the earth hold the treasure of

heroes, put the gold in the ground, where it still remains, as useless unto men as it was of yore."¹

Here also may be considered the ancient Scandinavian custom of preparing a funeral ship for the reception of a chief. A tomb chamber was erected on the deck, and in this were placed, not only the body of the deceased chieftain, but those of several horses and dogs, probably those of the animals of which he was especially fond, and which were undoubtedly killed, in order that they might accompany their master. Finally the entire ship was covered by an earthen mound which preserves the ship, in a fair condition, for future archeologists.

Such a ship may be seen, now placed within the grounds of the University of Christiania, Norway, and enclosed within a building. In this the tomb chamber is still in place, and the ship is adorned with rows of shields, overlapping one another along the sides. The human bones found in the tomb chamber were those of a very large man, and are placed, together with those of the accompanying animals, on tables near the ship. The announcement has just been made of the discovery, by Prof. Brögge of the same University, of another such "Viking ship," in a still better state of preservation, and with the usual number of dogs and horses, but the human skeleton within the tomb chamber is that of a woman, a "queen," instead of the usual "king."

Aside from all mounds of human construction, defensive, funeral, or commemorative, there are several natural agencies which are capable for producing well-formed mounds. These are liable to excite the interest of people, and the archeologist would do well to familiar-

¹ "Beowulf," XLIII. Tinker's translation, 1910. p. 141.

ize himself with them and their characteristics. The *drumlin* is a geological formation produced by the action of the glaciers. It occurs commonly in association with other glacial phenomena, such as gravel hills, and gravel embankments, and any mound that is found in such company should be treated with some suspicion. Another sort of mound may be the result of the fall and consequent uprooting of a large tree in early times. The earth over a considerable area is brought up on the roots, and, after the final decay of the woody structure, assumes an oval shape, rather symmetrical in outline. This sort of mound is usually accompanied by a corresponding depression on the side from which the wind came that originally uprooted the tree. Ant-hills are responsible for certain small mounds, but, aside from the tropics, no very considerable mounds ever come from this source.

23. *Cists, Tombs and Sepulchral Chambers.*—One of the beliefs deeply imbedded in primitive folklore is that the body laid away is in a sort of sleep, and that it still requires a house as much as, or even more than, when it was alive. There thus arises the idea of the vault or tomb, either for a single individual or for a family or other association of individuals, and there is often, as would be expected, a definite similarity in architecture between the more elaborate tombs and the houses of the living.

One of the simplest types of receptacle for a dead body is the *cist* or *stone coffin*, which consists of four sides, forming an oval or rectangle, with flag-stones for the floor, and either a single large slab, or several smaller ones, for the roof or cover. These are usually designed

for the reception of a single body, and are often so small as to necessitate the folding of this one into a compact parcel. Occasionally a cist is of large dimensions and designed for several bodies.

Cists in their typical form are frequent in many parts of Europe, many often occurring in association, making a localized necropolis or cemetery. Thus in the Breton island of Thinac, within a space of one hundred and sixty meters, no less than twenty-seven stone cists were unearthed, some of which contained single skeletons, others two, three, or even four. With these were associated implements of polished stone and a little pottery, marking the burial as Neolithic.

An earlier stage of the idea that developed into the cist is seen in the ring or oval found occasionally in Indian mounds in the United States, where the body is found wholly or partly enclosed by stones of various sizes and shapes, placed horizontally and without either floor or cover.¹ By selection of better shaped stones, that is, flat slabs instead of boulders, and by fitting them into box form, the walls of a typical cist are made. Beyond the simple cist comes the *gallery-grave*, a more complex stone structure, covered with earth heaped up in the form of a mound, designed for the reception of a large number of bodies, and intended either for repeated opening for additional interments, or for a final sealing up at one time. Although there is much indi-

¹ Cf. for instance; Cyrus Thomas, "Mound Exploration," 12th Ann. Rep. Bureau of Ethnol., Fig. 31 (Wisconsin). As an example of a more finished Indian cist, though without cover, cf. the same, Fig. 81 (Alexander C., Ill.). Cf. also, in the same, an account of the late stone graves near Prairie du Rocher, Ill., pp. 136.

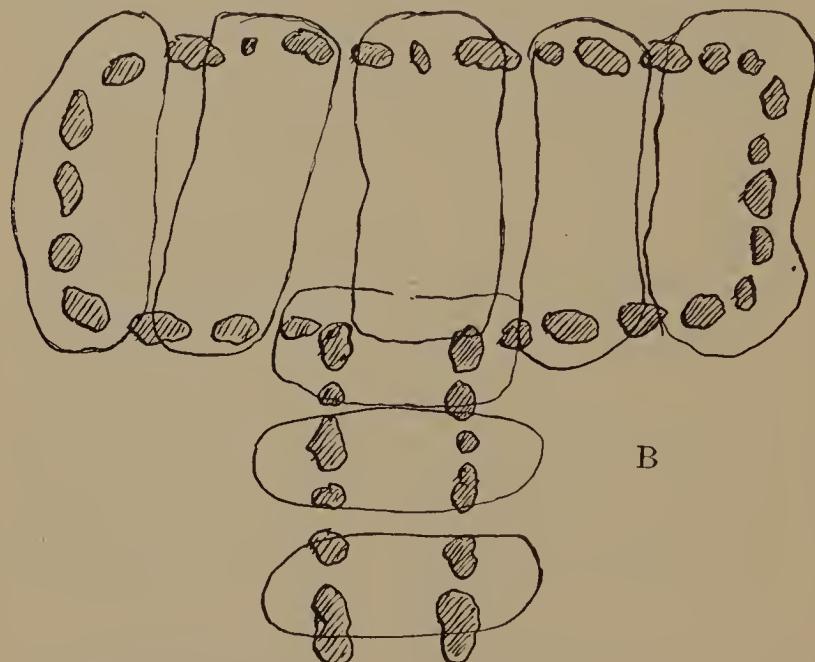
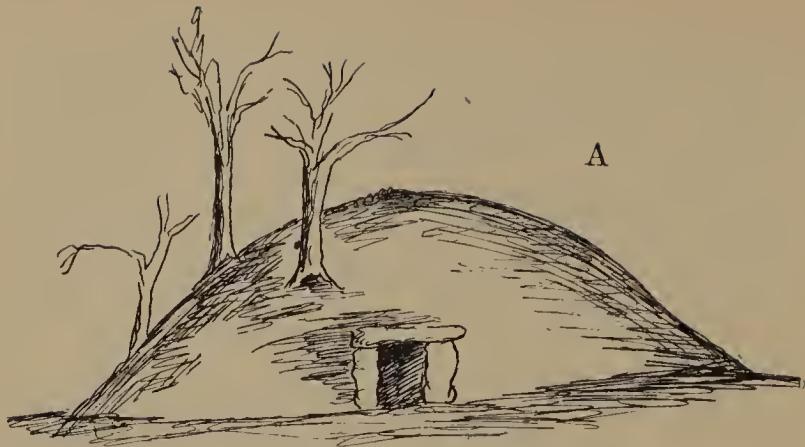


Fig. 23.—A typical gallery grave, with a single opening. Precisely similar structures occur, formed of the stone parts alone, but without a covering tumulus (a) View of the entire mound, with the mouth of the gallery, leading into the interior. (b) Ground plan of (a), showing the internal structure; the uprights are shaded, the flat stones that form the roof are given in outline.

vidual variation in these structures, so that no two actually correspond, they are similar in general plan.

A gallery-grave is essentially a large cist, forming a room, or tomb chamber, from which extends a long, low gallery. Both tomb chamber and gallery are roofed, the former with, perhaps, a single flat slab, the latter with a succession of smaller ones. This entire structure, chamber and gallery, is buried beneath a mound of earth, except perhaps at the mouth, and so shaped that the tomb chamber is central, that is, placed beneath the highest point of the mound. Thus completed, the entire structure forms a tumulus, with an opening in the base or not, and with a stone core.

Gallery graves occur, with two parallel galleries instead of a single one, but leading into a single tomb chamber; again, a single mound may shelter a number of independent tomb chambers, each with its own gallery.¹

Since, now, a tumulus consists simply of loose earth, heaped up over a stone structure, it is probable that in some cases the earth may eventually become eroded and washed entirely away, revealing the stone core, in its original form. In point of fact there are found just such structures, identical with the stone core of typical tumuli, easily explained on this basis, but otherwise quite problematical. In these the tomb chamber itself, with

¹ Such a double gallery grave, with the tumulus still intact, occurs at Mön, Denmark (Forrer, "Urgeschichte des Europäers," Taf. 82, Figs. 3 and 4, p. 249); and a large tumulus at Fontenay-le-Marmion, Dept. Calvados, in the eastern part of France once sheltered 11-12 independent gallery graves, each terminating in a small circular chamber (Déchelette "Manuel d'Archéologie," 1808, T. 1, p. 398, Fig. 141).

its flat top and its lateral supports, often forms a typical dolmen, with a passage (the gallery) leading into the interior, and if we follow up this idea to its logical conclusion, it becomes conceivable that all dolmens may have been originally the central tomb chambers of tumuli, and that, either by the hand of later man, or by natural erosion, the earth has been removed, leaving the megalithic structure bare.

In cases where a dolmen occurs alone, without an introductory passage, this latter may originally have been of wood, and hence perishable, or else the stones may have been subsequently removed, or, finally, it may never have existed, and the chamber alone may have been constructed and sealed, as was believed, permanently, after the reception of its distinguished dead.

As the menhir, among a people of growing culture, becomes eventually an obelisk, and as the cromlech becomes the circular temple, with its sculptured columns, so, if we accept the above explanation, does the tumulus become the pyramid, especially as pyramidal, as well as conical, tumuli are occasionally met with. In both cases there is, as the nucleus of the whole structure, the sepulchral chamber, sometimes communicating with the exterior through a stone-lined passage, sometimes permanently sealed, without communication with the outside. When the tumulus is of earth, it is liable to become removed, leaving the original stone structure in the open air; in the Egyptian pyramid the tumulus, as well as the core, is of stone and mortar, and yet the erosion has already begun in many places, and has frequently converted the sides, originally made smooth by mortar, into a series of gigantic steps, up which tourists

are now hauled by Arab guides, a feat never intended by the men under whom these great structures were originally constructed.

Occasionally in Europe a dolmen occurs, surrounded by a larger circle of stones of which it is the center. This outer wall suggests by its proportions its former use as a low retaining wall around the perimeter of the original tumulus. To those archeologists who prefer to abandon all idea of a connection between a tumulus and a dolmen, the outer circle marks a sacred precinct drawn around a tomb, presumably that of some deified ancestor, and always, as now, intended to stand in the open air. Continuing this idea one is led to see in the much more pretentious cromlechs at Stonehenge and Avebury larger tombs of the same sort, differing mainly in the number and size of the enclosing circles. It is also possible, for those thoroughly committed to the tumulus theory, and the original covering up of such stone structures, to believe that even these great structures were once the cores of gigantic mounds, the washing away of which, as in the case of the smaller tumuli, has revealed the great monoliths as at present. As a matter of fact, the outermost circle at Avebury is still surrounded upon its outer side by an earthen rampart, which is sometimes interpreted as the remnant of the original tumulus, marking its periphery. Yet the argument is not a strong one, and the data are certainly too few to allow a definite assertion either way. The similarity in architectural plan between these large and complex temples and a simple dolmen, when surrounded by a circle of stones forming an *enceinte* or enclosure is undeniable, but can be explained by the very probable assumption

Jones,
"The Stone
Age,"

that all of these works were done by the same people, or by people in the same stage of development. At any rate there seems to be no necessity for believing, because of a similarity in construction, either that all were meant to be earth-covered, or that all were meant to stand free in the open air, but that both types of construction existed side by side.¹

Dolmens occur in many parts of Europe and Asia, as well as Northern Africa, coinciding very well with the distribution of other megalithic structures. In general "this territory commences in India, and comprises Syria, the Caucasus, the Crimea, many points of the northern littoral of the Black Sea, Northern Africa (Sudan, Tripoli, Tunis, Algeria and Morocco), Spain, Portugal, France, the islands of Brittany, Belgium (rarely), Holland, North Germany, Denmark, and the southeastern part of Sweden."²

This extensive distribution puts an end to the old and formerly popular theory which considered these structures the work of the Celts, while the close analogy that often exists between the tumuli of the Old and New Worlds, and the study of the associated objects in each case, attaches them definitely to a culture that was late Neolithic, or to the early Bronze Age immediately ensuing. As in Europe and Africa, the North American

¹ Since, in the case of a great leader who becomes deified after his death, his tomb eventually becomes a fane or temple where his worship is conducted, the question of what such a structure was when originally constructed becomes of no importance. Thus both Stonehenge and Avebury, and other structures like them, may have been originally erected as tombs, the deification of the occupants of which had the effect of converting them into places of special worship—*i.e.*, temples.

² Déchelette, *loc. cit.*, p. 412.

mounds are mainly funereal, and bear at their cores the plentiful traees of early interments; often, indeed, the well-preserved skeletons of the original occupants. In all of these struetures, when sufficiently obvious to attract attention, the archeologist must be continually upon his guard against *intrusive burials*, that is, burials made by a later people, unconnected with the original structure. This phenomenon is commonly met with in Indian mounds, where the artificially piled-up earth offers better facilities for excavation than the natural soil; there may have been also some feeling of sanctity or veneration concerning such places, where there are possibly traditions of actual heroes of the past, or at least the feeling that the purpose of the mound is mortuary. Such intrusive burials occur irregularly disposed over the surface, and bear no relation to the structure as a whole, as is the case with the rightful occupants. Similar intrusive burials have been observed in Europe, where cists or coffins of the Bronze Age, for instance, occur within the galleries of a Neolithic people.

24. *Special and Peculiar Methods of Disposal of the Dead.*—To a primitive philosophy a dead body is a curious combination of something to be cherished and something to be dreaded. The processes of decay, accompanied by the development and transformation of numerous creatures, especially various kinds of dippterous insects, are to primitive people wholly mysterious and inexplicable, and furnish a basis for superstitious beliefs. It is probably on account of this latter phenomenon rather than from the disagreeable nature of the proeesses of decay, to which primitive man would not be especially sensitive, that numerous more or less

singular procedures connected with the disposal of the body have arisen. Thus certain of the Prairie Indians declare that the first people, finding that a dead body became filled with living things, from which came spirits that flew away to the moon, and fearing that in this way the earth would become depopulated, wisely put a stop to this by inaugurating the practice of cremation.

Another almost universal belief is in the possibility of the return of the body with the desire to do mischief, either to avenge his death upon the person or persons who have caused it by their enchantments, or to take off with him those whom he has loved in his former life. Again, the fear may not be of the man himself, but of a demon or vampire, which may possess himself of the body, having none himself, and in this borrowed form may creep back to the village with malign intent. To these motives is undoubtedly due the widespread practice of tying or wrapping the body, with the arms and legs folded or bound securely; and some see this idea also in the use of stone enclosures and even in tumuli.

This fear of the body is combined with respect for the remains in the custom of collecting the bones, and reburying them in a special vault, cist, or urn; also the practice of the cinerary urn, to hold the ashes of the deceased belongs here. By all these means the body is rendered innocuous, while it may still be preserved or kept near the former friends.

Bones may be obtained by exhumation after a suitable period, or may be directly prepared, somewhat after the methods of a museum preparator, by cutting off the soft parts and boiling the remainder. Often the skulls only are saved, and these are sometimes decorated

or carved, those of friends through respect, those of enemies as a sort of exultation over the victory. Often, too, the bones, not merely of a single individual, but of an entire family or small tribe, are, after suitable treatment, either reinterred, or placed together in a vault, cist, or other container, and forming what is known as an *ossuary*, that is, a collection of bones. For the holding of such collections, particularly the bones of single individuals, large vessels of pottery, funereal urns, are frequently employed, and cases are occasionally met with in which an entire body, without previous dismemberment or process of skeletonizing, is placed in a folded position in a large urn, or beneath an inverted one, the so-called *urn-burial*. Customs analogous to all of these still obtain in places among cultured races, as, for example, the costly reliquaries of gold, silver and jewels that enshrine the bones of saints, and are stored in the treasure chambers of great cathedrals, or as the catacombs at Palermo, which were in actual operation until about 1890, and in which are stored the bones and dried bodies, not of monks and priests alone, but of thousands of the secular inhabitants of both sexes and all ages.

The natural tendency to desiccation where the air is dry seems to have been the suggestion from which have been developed the various methods employed in mummifying or embalming the dead, either entire, or, what is more usual, after removal of the viscera and, sometimes, other soft parts. Such bodies may then be kept in the houses of the living, or house-like tombs may be constructed for them, in some cases forming an extensive city of the dead, or *necropolis*. This tendency to segregate the dead is by no means confined to em-

balmed bodies, and arises from several motives. Where, for example, a natural grotto or spacious artificial tomb is employed, the reason of this segregation is obvious; in other cases it may be due to respect, as with the Egyptians, or to a superstitious dread, which is minimized by placing the dead in a place by themselves. In this connection the heavy enclosing walls and iron fences about the cemeteries of modern cultured races are significant. Still another reason for segregation may be found in the existence of places of especial sanctity, and the desire of friends to place the bodies there. This tendency is seen, not only in the crypts and vaults of cathedrals and abbeys, and in churchyards, but in the great number of stone tombs placed about such sites as Stonehenge and Avebury, and possibly in the many intrusive burials in ancient tumuli.

All of these mortuary customs are of the greatest interest to the prehistorian in explaining the conditions unearthed by him, as often a slight indication may suffice to show some ancient custom and suggest the general cultural development of a people. Of all the above cremation is, of course, the most destructive of data, but the existence of cremation among a prehistoric people, as evidenced by the remains of calcined bones, mixed with ashes, perhaps placed in some receptacle, is in itself an important evidence. Thus, where in Europe the neolithic inhabitants buried their dead, surrounded by their possessions, the people of the Bronze Age for the most part burned theirs, thus suggesting the conclusion that both the new metal and the new method of disposing of the dead were introduced simultaneously by a race of invaders, possibly those termed the Aryans.

25. *Town and City Sites.*—The primitive “city,” as seen by the stories of the founding of Rome and Carthage, or by the descriptions of cities in the Old Testament, was a walled enclosure, built wherever it was most safe and convenient; usually upon a hill, and necessarily of small proportions. The establishment of such a city was usually the work of one man and his family and dependents, and, although often elaborated later, the original structure was such as could be put up by a few hundred, or even a few dozens, of men within a comparatively short time. Thus the city of Romulus was built upon but one of the seven hills of later Rome, the Palatine, and the early inhabitants, living in “circular or oval wattled huts,”¹ could look across their earthen rampart and their outer moat to similar cities upon the neighboring hills. The traveler who penetrates into the interior of the western Sahara, south of Morocco, still finds similar conditions, with walled “cities,” the dimensions of which are easily given in feet rather than miles, and where family feuds still flourish, and city rises up against city, as in the days of the Jewish kings. At a later day, when such a city becomes larger, and is enclosed with a pretentious wall of stone with battlements, the original hill-top, upon which always stood the “palace” of the “king,” becomes the citadel, the spot of the greatest veneration. The original palace becomes the temple, and the hill a sacred enclosure. Thus the Acropolis of Athens was anciently the entire city, not unlike many others in the same region. It was especially favored by fortune, however, a larger city was

¹ Frothingham, “Roman Cities in Italy and Dalmatia,” 1910, p. xvi.

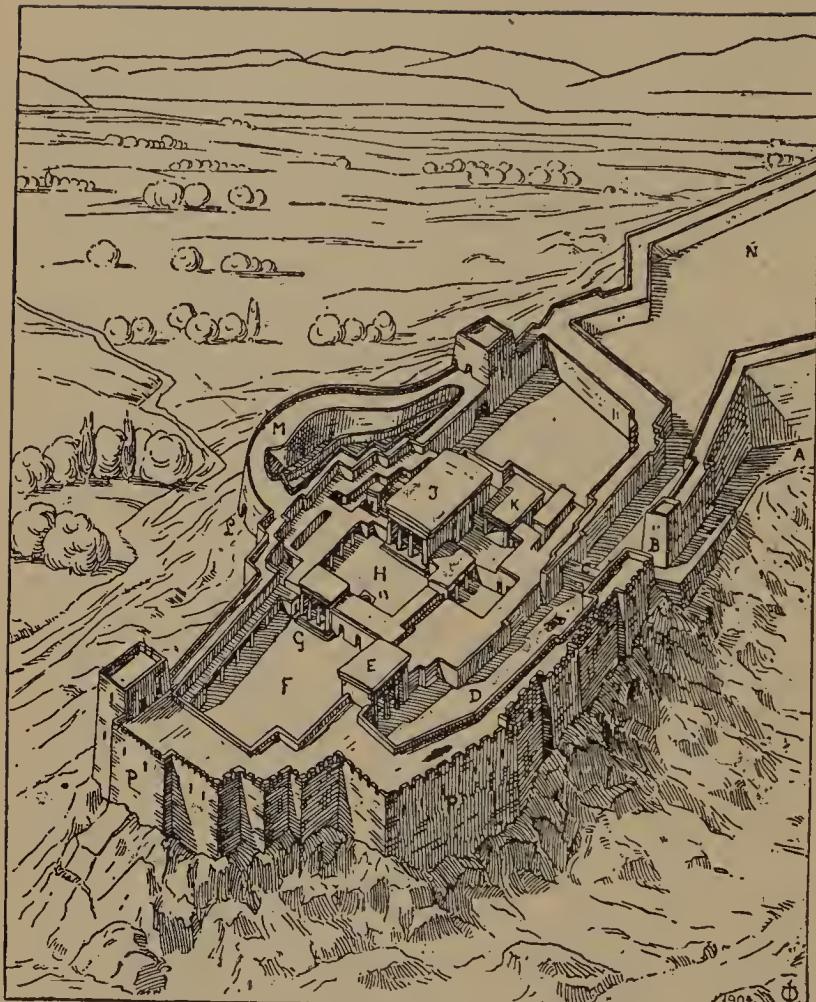


Fig. 24.—The Mycenaean city of Tiryns, restored in accordance with the data obtained by Schliemann. A typical hill-top city, at its zenith, but not yet an acropolis, since there is no surrounding settlement, and since all the inhabitants dwell within the city walls. The development of dwelling sites in the plains, about the base of the fortified hill, would convert the original city into the sacred enclosure in the heart of the greater city, the center of the religious life. (From Forrer, after Leonhard and Schliemann.)

built around it; the old palae of Erechtheus became the predecessor of the Erechtheum; and the enclosure, now rendered sacred to its inhabitants, rose with their prosperity and became eventually covered with pretentious temples.

Such a site, when either continuously or intermittently inhabited, becomes in time a rich archeological museum, since numberless durable objects become lost or thrown away, and remain in the soil. After a long period of occupancy, followed by destruction at the hands of a successful foe, the ruins of such a city may remain deserted for hundreds of years, and become gradually covered by dust or sand; when next selected as a city site, perhaps by a tribe who knows nothing about the past history of the place, any walls that are still standing may either be used as a quarry out of which to select building material for the new ones, or they may be simply leveled, and the new city, naturally without cellars, would be built on the top of the old. In this way the site of Hissarlik, the traditional site of Troy, was occupied successively, at long intervals, by different peoples; and Dr. Schliemann, running his trenches through the soil, found, not only one Troy, but seven, representing as many distinct stages of culture, and all prehistoric. There was found no trace of inscription of any kind, and the entire history of the seven superimposed cities was made out wholly upon the evidence of their material culture, as expressed in their utensils, their weapons, their pottery, and their house sites, with some evidence of their physical structure, as deduced from their bones.

Similar city sites occur in considerable abundance in

the peninsula of Greece, in Crete, in Egypt, in Asia Minor, and Syria, especially Mesopotamia, but in many cases, although the ruins often abound with works of considerable artistic merit, there is no inscription to tell us even the name of the city or of the people who inhabited it, or to bear witness to the use or knowledge of writing in any form. Egypt, however, developed very early a system of hieroglyphics, by means of which the successive dynasties may be arranged in chronological order; in Mesopotamia the cuneiform developed from an older picture writing, and thus preserves to our time upon practically imperishable tablets and cylinders of clay the names of peoples and kings of otherwise forgotten millennia; and a form of inscription is found in Crete, although as yet unread. Yet for a single city site linked to history by decipherable inscriptions there are dozens of others without such records, where the only clues to chronology and racial affinities appear in the artifacts and graves.

The most important city sites are confined to the warmer regions of the globe, especially the warm temperate and sub-tropical climates, where otherwise the conditions are the best for an early development of civilization, and within those regions all the continents are well represented. While in the Old World many of these sites bear some probable relation to known history, or at least to tradition, the similar remains in the New World are without such connection, and their origin and chronology must rest upon deduction. The chief sites of early American civilizations are collected about three geographical centers, Mexico, Yucatan and the highlands of Peru, and represent the highest point attained by the

American race. These civilizations seem in some cases to have been active and flourishing at the time of the early Spanish *conquistadores*, like Cortez, Pizarro and Balboa; but these men were unfortunately adventurers without scientific interests, and ruthlessly destroyed the cities and slew the inhabitants. The famous "gold of the Incas," found in considerable profusion, not in Peru only, but in many other places as well, was taken across the Atlantic in Spanish ships, and the artistic and beautiful forms into which it had been shaped by the Americans, objects that would have invaluably enriched the museums of the world, were transferred into coin, and played a new and important part in developing the armies and controlling the diplomacy of Europe. Had these objects of art been made of a less valuable material they would probably have been preserved, and would have been of the greatest assistance in the study of the times and the people that produced them.

The plentiful remains of walls and temples have proven more durable and are found scattered all through central America, the beautiful, profusely carved ruins overgrown by luxuriant vegetation and hidden in the depths of the tropical forests. These carvings, and the plentiful artifacts found in the sites are essentially similar in style to known objects of modern Indian origin, and leave no reason for the supposition that they were the work of an unknown race. Favored by the climate, and with the natural products of the region, the inhabitants rose higher in the scale of living than did the aborigines in other places, but, considering the relative advantages, and the material furnished by their natural surroundings in the two cases, the Iroquois of the north-



FIG. 25.—The South Town of the Taos; a typical New Mexican pueblo, 52 miles northeast of Santa Fé.
(After Winship.)

eastern United States compare very favorably with the southern nations, and at the time of the discovery, although laboring under all the disadvantages of a harsher climate and an unproductive soil, had laid the foundation for a state of society which, but for the invasion of the whites, would have soon developed into a comparatively high state of civilization.

Another good example of organized communal society, combined with the construction of a compact "city," in which the separate dwellings are joined into one vast edifice, is seen in the "pueblos" of the southwestern United States, a few of which, like the Zuni and Hopi, are still populous, while others have become deserted, either since the advent of the Spaniards, or in prehistoric times. Of the ruins some are located in great niches high up on the cliffs, and form the well-known "cliff dwellings." All of these, both modern and ancient, possess a general resemblance to each other, and represent an entirely different solution of the problem of defense from that of a town enclosed with walls, so universal in the Old World. In the true cliff dwellers, sufficient protection was afforded by the altitude of the cliff, so that a defensive technique through the building of walls and ramparts never developed. In the pueblos of the plain the structure itself, wholly or mainly artificial, represents the cliff, and the actual dwellings are entered at a considerable height from the ground, and, as in the former case, by a ladder.

In parts of the world other than those above mentioned, the development towards civilization seems not to have been towards the building of cities, but to have expended itself rather in personal decoration, the manu-



Fig. 26.—Ruins of "Cliff Palace"; Mesa Verde National Park, Colorado, "a pueblo built in a cave" (Frewkes). This is a typical though unusually extensive, cliff-dwelling, the prehistoric predecessor of the plains-pueblo of modern times. (From a photograph loaned by C. C. Willoughby.)

faeture of beautiful implements and weapons, and in the practise of hazardous and warlike deeds, so that a people who, from their artifacts, would show a high grade of eulture, would be found living in eaves or in low huts of the simplest construction. This explains the absenee of city sites in northern Europe before late prehistoric times, while otherwise civilization reached a high point.

In two most unexpected regions oceur ruins which, although of the simplest construction, are as yet entirely unsolved. These localities are Rhodesia, South Afriea, and the island of Yap, in the Caroline group, South Paeific. These ruins consist of walls of so-ealled Cyclopean masonry, and have not as yet been suffieiently excavated to find what forms of artifacts, if any, are connected with them. In spite of the somewhat extravagant speculations excited by the presence of ruins like these in such unexpected places, their significance is probably merely that of ancient dwellings, or "eities," built by the ancestors of the present inhabitants, perhaps something like those of the pueblos of Arizona and New Mexico, and does not demand the hypothesis of great civilizations, now absolutely lost and forgotten.

26. *Culture Sites Buried Beneath Volcanic Deposits.*

—The classical illustration of this condition is that furnished by Pompeii and Herculaneum, an occurrence well within, not merely the historic period, but at a time and place which produced exellent contemporaneous written records. It is always possible, also, that a similar site from prehistoric times may be brought to light, and there is every reason to expect that in that case the pres-ervation of objects would be as perfect as at Pompeii.

The experiences there acquired, and the numerous methods of excavation and after-treatment, are therefore of great value to the historian.

In a few localities the probable or certain remains of early human activity have already been found preserved beneath deposits of volcanic origin, although the finds themselves are of rather subordinate interest. Thus at Aürillac in Cantal, Dept. Auvergne, France, there occurs beneath volcanic deposits of upper Oligocene date a stratum of sand filled with typical eoliths, that is, rough pieces of flint with somewhat doubtful indications of use such as would be given them if employed for simple purposes by a hand shaped like that of man (cf. discussion of eoliths in §§32 and 33). It is assumed that the sand was accumulated along a river bank, burying from time to time the worked flints left there, and that ultimately the volcano of Cantal awoke to activity and covered with its deposits the entire region, a veritable "eolithic Pompeii."¹ Another ancient site, referred to the Magdalenian Period in the Quaternary, has been found above Andernaeh on the Rhine, where beneath a volcanic deposit are found hearths, split bones of horse and reindeer, objects of bone and horn, such as harpoons and lances, as well as numerous paleoliths. Although the most of the volcanic deposits of this region date from the Oligocene, as in the previous case, the character of the artifacts and the species of animals represented, as found below the lava, place this particular eruption much later, a conclusion also allowed from the geological conditions.

¹ Cf. Forrer; *loc. cit.*, p. 35.

Perhaps no extensive prehistoric site of this nature, with remains of man himself as well as of his work, may ever be found, yet it is always a possibility, and if found is liable to yield results which, in completeness of preservation, far surpass anything hitherto brought to light.

Somewhat similar in final result to an inundation of lava is the overwhelming of a culture site by a landslide. Traditions of such catastrophes within historic times exist, like that of the supposed mediæval town of San Maurizio, near Porlezza, at the east end of the lake of Lugano, in Italy, which is the local explanation of the presence of a ruined church tower, of the twelfth or thirteenth century, situated close under the mountain, and partially buried beneath a detritus of small stones. Such a circumstance would be naturally very unusual, yet it is to chances like these that archeology, historic or prehistoric, is often indebted for the preservation of some of its most valuable material, and is here mentioned as a possible cause for the preservation of data.

27. *Search for Objects Lying Under Water.*—This form of archeological investigation, for a long time alluring in its possibilities, has been actually employed only within the past few years, but has already yielded many valuable results. Thus far the work has been confined to lakes and rivers, and to the shallower seas and harbors, but it is within the range of possibility that even the deeper waters of midocean may not prove to future generations so inaccessible as to us, and that even the ocean depths may some time be made to part with their records of early history. Although owing to the late development of ocean navigation such finds will belong practically to the period of written history, there

is no question but that the ocean is already a vast store-house of objects of human workmanship, the results of countless shipwrecks.

True prehistoric remains, on the other hand, are to be looked for in the waters of lakes and rivers, and those which have been the center of human life and activity from the earliest times, such as the Tiber, the Seine, and the Thames, must cover inexhaustible museums of objects, sunk deep in the slime of their beds, yet capable of ultimate recovery through methods already known or soon to be perfect.

The methods to be employed in such research are naturally of two kinds, dredging or scraping the bottom by means of instruments let down from the surface, and draining or diverting the water for a time, thus laying bare the bed and rendering it accessible to the ordinary methods of the excavator. Thus a project for temporarily diverting the course of the Tiber as it flows through Rome has already been agitated, though as yet without results. Such an enterprise could hardly fail to bring to light objects of the greatest value, the seven-branched Jewish candle-stick, to mention one of them; yet the astonishing unproductiveness of the Lake of Haarlem in Holland serves as a check upon excessive hope. This lake was formed in the fifteenth century by the overflow of the Rhine, and became the scene of continual activity, including a naval battle. This lake was drained by extensive and costly engineering operations conducted through the years 1840-1853, yet the land once covered by it, eighteen miles in length and nine in breadth, has yielded nothing whatever of the objects which must have been lost in its waters during the four

centuries of its existence, and this in spite of the very numerous irrigation ditches which traverse every portion of the reclaimed area.

The other method of search, that through various forms of dredging, has thus far been much more productive, and has been greatly assisted in late years by the employment of various methods which in shallow waters render the bottom more or less clearly visible. Thus a form of water telescope, the *bathyscope*, was instrumental in the recovery, in 1900-1901, of a shipload of bronze and marble statues, wrecked off the island of Cythera in early Roman imperial times, as they were being carried to Italy. After being discovered they were obtained by divers, and now form some of the most noteworthy objects in the National Museum at Athens. Another instrument with a similar object, the *hydroscope*, has recently been perfected by an Italian, Giuseppe Pino, and is being applied to a search in Vigo Bay, off the coast of Spain. These and similar methods may be looked to for the recovery of much valuable material of the more recent period, although addition to our knowledge of actual prehistory by this means is not to be expected.

28. *Chance Findings*.—Wherever men have lived and wandered, whether as solitary hunters or as nomadic tribes, they carry with them objects of a durable nature, so elaborated by their own skill as to be easily recognized as the product of human handiwork. Such objects, of stone, of bone or metal, of clay or glass, collectively termed *artifacts*, furnish imperishable records of man's former activity. As described above, artifacts collect about the sites of continuous human occupation, and are

thickly strewn among the ruined walls of prehistoric cities or upon the floors of cayes used as dwellings. Aside from such general localities, where artifacts are lost or dropped at random, they are often intentionally placed in the graves with the dead, or committed to the ground for safe keeping and never recovered. It thus happens that, in lands where man has long existed, the earth becomes strewn, as it were, with cultural objects, and these may be met with at any time. Thus almost every American has picked up in the field, or along some country road, at least one flint or quartz arrow point, or perhaps a stone axe; while in many parts of Europe artifacts, not of stone alone, but often of bronze or other metal, are frequently found, as well as coins and bits of glass from later periods. It is obvious that such objects, although distributed without system, are yet most frequently met with in places which, from reasons of physical geography, form natural trails or passes, or where a protected bit of meadow land offers advantages to the primitive agriculturist. It is, for example, a general rule that towns and villages are located among favorable natural surroundings, and that the same advantages, like a bend in a river, a tributary stream, a hill slope with an exposure in some definite direction, with numerous springs along the higher levels, and so on, are equally desirable in all stages of culture. It thus happens that in a country in which one population is replaced by another the centers of population of the two for the most part coincide, and that the cities of the replacing folk are erected on the ruins of the old. Thus it was that the promontory of Troy has been the seat of seven culture sites, while the surrounding coun-

try has none, and thus also, in America, the sites of the most important of the aboriginal towns are now, with a few exceptions either way, occupied by the largest towns of the European race. Since, moreover, a trail or road is constructed for the purpose of connecting important centers, these will also coincide, and thus one culture covers another.¹

As a result of the above principles, the very best places in which to look for chance findings from past times are approximately those which are most populous at the present day, or, as this is often inconvenient, the fields and lanes in the immediate vicinity.

Often, too, the topography of a country concentrates human traffic along definite restricted places. This is illustrated simply by the numerous "carrying places" for canoes in the wilderness of Maine and Canada, narrow places between two river systems near their headwaters, and as the same carrying places must have been used for many hundreds, if not thousands, of years, they are especially favorable for the search for objects of human culture. An important mountain pass illustrates the same principle upon a much greater scale, since not only has the general traffic between the lands thus connected been concentrated along certain of these, but large armies have marched over them, with all the chances of

¹ In New England, where a thriving European population has replaced a populous aboriginal one, many of the principal highways coincide with important Indian trails, and the history of the transformation from one to the other is well known—trail, bridle-path, country road, and finally state road covered with macadam or tarvia. Thus the "Old Pequot trail" in Rhode Island, from Narragansett Pier to Westerly, or the trail from Patuxet (Plymouth, Mass.) to the Wampanoag center at Sowams (Warren, R. I.).

losing various objects. Occasionally, also, some local condition tends to concentrate objects of a particular kind in a single place, the explanation of which is not always clear. Thus a certain ploughed field in Massachusetts was for a long time a noted place for stone arrow heads. Many handfuls were picked up in a definite spot, with a radius of fifty feet, but in nearly all cases the points were broken off. An examination of the locality revealed the following: The field lay along the side of a gentle slope, at the foot of which ran a little brook which expanded here into a natural spring. Restoring in imagination the early conditions, we would have an aboriginal forest of great tree trunks clear of undergrowth, and deer frequently coming to the spring. The hunters would naturally resort to this place, concealing themselves upon the other side of the brook, which offered a better view of the spring, and shoot at the deer as they came down to drink. The arrows that missed would strike the trunks of the trees in the opposite hillside, a distance of only twenty-five to fifty meters, and would either fall to the ground or remain imbedded in the trees. The fall and decay of the tree trunks would liberate the included arrowheads, and this process, continuing for a long period, would ultimately concentrate a quantity of these at this spot, mainly with the points broken by impact with the tree trunks.

CHAPTER III

EUROPEAN PREHISTORY

Importance of Europe in the Study of Prehistory—The Four Ages of Human Culture—Recent Modifications of Prehistoric Chronology—*The Eolithic Age*—Characteristics of Eoliths—The Users of the Eoliths—The Period of Strépy; the Transition to the Paleolithic—*Early Paleolithic Times*—The Chellean Period—The Acheulian Period—*Middle Paleolithic Times*; the Mousterian Period—The Aurignacian Period; the Solutréan Period; the Magdalenian Period—*Late Paleolithic Times*; the Azilian-Tardenoisian Period; the Kitchen-Middens—The Transition to the Neolithic—*The Neolithic Age*; Modes of Living; the Art of Weaving; the Ceramic Art; Masculine Activities—Megalithic Temples—The First Metals; *the Cyprolithic Age*—Casting and Smelting; the Advent of Bronze—*The Bronze Age*—The Introduction of Iron—*The Early Iron Age*; the Hallstatt and La Tene Periods—The Transition from Prehistory to History.

29. *Importance of Europe in the Study of Prehistory.*—Not only has the foundation of the science of prehistory been laid by Europeans, but the great majority of the objects upon which the science is based have been excavated from European soil and stored in European museums. In Europe, also, there has been a practically continuous history of human development from the first rude attempts to employ the external forces of nature to the highest modern culture, and the periods into which this enormous extent of time has been divided have been without exception based upon European material and named from European sites. It is *á priori* probable

that in either Asia or Africa, certainly in the former, the history of man has been equally long and equally continuous; it may even be that here occurred the actual development of the successive human or semi-human types that have appeared in Europe from time to time; yet thus far the Asiatic deposits have been but little worked, and the actual data for Asiatic prehistory are not yet in our possession.

As for the New World, the people inhabiting both North and South America at the time of the discovery belonged, with the possible exception of the Eskimos, to a single homogeneous race, that showed no definite indication of a long previous history on the continent. In culture, they exhibited, it is true, a number of different stages, yet these ranged mainly from the early Neolithic to the early Bronze Ages (the latter represented by copper), and furnished no generally acknowledged instance of Palaeolithic culture, or of Quaternary existence. Recent discoveries in the Delaware valley have proven to some the existence of a Quaternary human race, but the evidences are but faint, and restricted to this immediate region. The continent is thus capable of furnishing data for Neolithic development in place, and possibly for a disconnected glimpse of Quaternary man in a single locality, but there is nothing like the connected history of human development as found in Europe.¹

¹ The best general textbook of European Prehistory is that of Déchelette, "Manuel d'Archeologie," published by Picard, Paris. The first volume, "Archeologie Prehistorique," appeared in 1908, and a second Volume, "Archeologie Celtique," came out in 1914, but soon after the author fell in the defense of his country, and the place of Déchelette remains unfilled. A con-

30. *The Four Ages of Human Culture.*—The ancient classical writers declared that in the earliest times mankind, ever at strife each with his fellow, fought with such natural weapons as fists, teeth, and nails, augmented by stones, and by branches plucked from trees. They were for a long time ignorant of the use of fire, but after its employment had been learned, metals were gradually introduced, first bronze, then iron. There was thus established an early division of human history into three distinct *ages*, characterized respectively by the use of *stone*, *bronze* and *iron*.

Convenient compendium in small compass, richly illustrated and giving the essentials of the "Urgeschichte des Europäer," written by Dr. Robert Forrer, was published also in 1908, by Spemann, Stuttgart. A third general work of great value, although confined mainly to Scandinavia, is the "Nordische Altertumskunde" of Sophus Müller, the successor of Worsaae in the Museum at Copenhagen (2 vols. Trübner, Strassburg, 1898). The same author issued also a shorter and more general work by the same publisher, "Urgeschichte Europas," in 1895, which is especially full on the Bronze Age and later times, but neglects the Ages of stone. For these latter there is the book of Hoernes, "Der Diluviale Mensch in Europa," Braunschweig, 1903, well-treated but condensed; but by far the best, as well as the newest, is "The Men of the Old Stone Age" by Henry Fairfield Osborn (Scribner, 1916). This is limited to the times given in the title, but may be reinforced by Tyler's "The New Stone Age in Northern Europe," Scribner's, 1921, and by the works of the two de Mortillets, "Le Préhistorique," 1894, and "Le Préhistoire," 1910, both published in Paris. Other and older works in English are the classic of Sir John Lubbock (Lord Avebury), "Prehistoric Times," now in its sixth edition, and published by the Appletons; the works of Sir John Evans, "Ancient Stone Implements" and "Ancient Bronze Implements," from the same publishers, and Boyd Dawkins's "Early Man in Britain," now out of print, and extremely rare. A recent book by Sollas, "Ancient Hunters" (Macmillan, 1911) describes the men of the Stone Ages, and makes interesting comparisons between them and primitive tribes now living. There are also numerous reviews of foreign work given by George Grant MacCurdy in the *American Anthropologist* and in various Smithsonian Annual Reports. *U. S. Bureau*

Lucretius states with great clearness that "the ancient weapons were fists, nails and teeth; also stones, and added to these fragments of boughs from the forest; but after fire and flames were once understood, the forces of iron and bronze were discovered. The use of bronze was known before that of iron."¹

Horace, though less explicit, draws a spirited picture of early times. "When man first crept out of the new-formed earth, a dumb and filthy herd, he fought for acorns and lurking-places with nails and fists, then with clubs, and at last with arms, which taught by experience, they had forged. They then invented names for things, and words to express their thoughts; after which they began to desist from war, to fortify cities, and enact laws."²

It is then a little surprising that, with these clear statements of early beginnings before them—at once the most natural and, to scholars, the most probable—the philosophers of later centuries, blinded by the glamour of a former Golden Age, or Garden of Eden, rejected for centuries this natural method of subdividing human history. Yet this they did, totally and completely, and

¹ Lucretius, "De Rerum Natura," V. 1282 ff.

*"Arma antiqua manus, unguies, dentesque fuerunt,
Et lapides, et item sylvarum fragmina rami;
Posterior ferri vis est, aerisque reperta,
Et prior aeris erat, quam ferri, cognitus usus."*

Horat., Satirae; Lib I. Sat. III.

*"Quum prorcpserunt primis animalia terris,
Mutum et turpe pccus, glandem atque cubilia propter
Unguibus et pugnis, dein fustibus, atque ita porro
Pugnabant armis, quac post fabricaverat usus;
Donec verba, quibus roces sensusque notarent,
Nominaque invenero; dehuc absistere bello.
Oppida coepserunt munire, et ponere leges."*

it was revived only within the nineteenth century by a Danish scholar, Christian Thomsen. As curator of the great National Archeological Museum at Copenhagen, Thomsen arranged his material, excavated from the soil of the country, according to the threefold classification of Lucretius, *stone*, *bronze* and *iron*, and definitely established this as a scientific chronology in 1836.¹

This foundation laid by Thomsen was extensively built upon by his successor in the Museum at Copenhagen, Worsaae, who established a further subdivision of each of the three primary ages. It is of especial importance to note that his two subdivisions of the Age of Stone were (1) the Paleolithic, or Old Stone Age, in which the implements were crudely fashioned, and the surface left rough, and (2) the Neolithic, or New Stone Age, the implements belonging to which were ground down to a smooth, or polished, surface. His subdivisions of the other ages, though important, proved to be of subordinate value.

There were thus established four successive ages of human activity, as registered in the construction of their instruments, as follows:

I. Paleolithic Age; Old Stone Age; surface of implements left rough.

¹ Thomsen, C. J., "Ledetraad til Nordisk Oldkyndighed," 1836 (Introduction to Nordic Archeology).

For an excellent account of the development of this system, and of the activity of these founders of European prehistory, cf. Sophus Müller, "Nordische Altertumskunde," Strassburg, 1897. Bd. 1, pp. 217 ff. "Nilsson on the Stone Age" (Engl. Transl.; edited by Sir John Lubbock, is also a classic (London, Longmans, Green & Co., 1868). The original, entitled "Skandinaviska Nordens Urinvånare" (The Primitive Inhabitants of the Scandinavian North), appeared in numbers between 1838-1843. Nilsson was professor of Zoology at Lund, in Sweden.

II. Neolithic Age; New Stone Age; surface of implements smoothed ("polished").

III. Bronze Age.

IV. Iron Age.

This sequence of ages, although originally established as a relative chronology for the remains found in northern Europe, was soon found applicable to other regions as well, and *it even became probable that these four ages represent the successive and necessary steps of human development everywhere.* Aside from the differences in the types of implements themselves, other constant indications of distinct phases of culture were found associated with each type, so that gradually the main characteristics of each age became established.

Thus, in the *Paleolithic Age* man was a nomad hunter, without any knowledge of agriculture, of weaving, of pottery, or of the domestication of animals. He lived in caverns and rock shelters, the occupancy of which he disputed with the cave bear and other fierce beasts; his clothes, if any, consisted of the skins of animals. In Europe at least the early part of this age fell within the time of the Great Ice, and such glacial animals as the mammoth, the reindeer, the cave bear and the hairy rhinoceros, were man's contemporaries.

The *Neolithic Age*, judging from its remains, gives a much more pleasing picture. The glaciers had disappeared, save in the highest mountains, and a series of beautiful lakes occupied the lower levels. In some districts the man of this age lived in settled villages upon the rich alluvial plains which now extended in places

along the river valleys ; in others he planted piles over the shallow borders of the lakes, and upon them erected whole villages of huts, while, whenever opportunity afforded, he was still not above enjoying the occasional shelter of the caverns, now freed forever from the larger carnivora, and thus kindled his fires and held his feasts upon the very soil that had buried the remains of Paleolithic man and his activities.

He possessed herds of sheep and goats, animals, as some say, hitherto unknown in Europe, and presumably of Asiatic origin ; he tamed the horse, which a cruder age found useful only for food, yet failed to subdue the huge native cattle (*Bos primigenius*) and used instead a smaller allied form (*Bos taurus*), also apparently Asiatic. He was still a skillful hunter, and, especially in the lake villages, developed numerous methods of capturing fish. While the male members of the community engaged thus in the rougher occupations of herding and hunting, the women developed the arts of pottery and weaving, and actual fabrics, woven from the wool of sheep and the fibers of flax, gradually took the place of the more unmanageable skins. Whether the Neolithic culture was attained by natural development in place by Paleolithic Europeans, or whether it was imposed from without through immigration from outside of Europe, cannot at present be settled ; and the same question, although in a less insistent form, confronts the student of the transition from Neolithic to Bronze. Here, however, although the malleable metals themselves may have been introduced either through commerce or by invasion of alien people, there could have been no

complete replacement of one people by another, as some think may have been the case in the transition between Paleolithic and Neolithic.

The next age, which although termed the *Bronze Age*, is characterized by the introduction of all the common malleable metals found in a free or easily reducible state, begins with the use of such free metals as copper, tin, silver and gold, elaborated by pounding; then there are successively introduced the arts of melting the metals, and running the molten liquids into moulds; of mixing them in definite proportions to obtain results better suited to definite purposes; and finally of reducing certain of them from their ores, thus greatly increasing the amount of available material.

From the Age of Bronze, during which there developed the simple smelting operations necessary to obtain copper and tin from ores, the transition to the use of *iron* was but a step, and consisted mainly in the discovery of methods whereby the ores of this metal, more refractory than those of copper and tin, could be similarly reduced, and here, along various points through the metallic ages, written history begins. Before this, through the obscurity of the early, half-forgotten legends of the great historic nations, we hear the clash of bronze swords against bronze armor; and the ringing blows struck by Achilles, by David, or by Siegfried, blend with the cadence of epic poetry. These immortal poems of the heroic ages give us rare glimpses of Bronze Age culture: now a banquet hall, now a public sacrifice, or funeral games, and again an idyl of primitive family

life. Discounting the glamour placed about them by the bards, and studying them in the twin lights of excavation and ethnology, or the study of primitive peoples still extant, these poems describe for us in often the minutest detail, the times and the people long thought forgotten or wholly mythical. Greece was scarcely beyond the Bronze Age when she acquired the art of writing from further east, and the rapid dissemination of this art through the rest of Europe found the natives in various stages of culture, mainly at about the transition from bronze to iron. And here, with the ability to record the annals of the people in some form of writing, the spade yields to the pen, and the task of the prehistorian is over.

31. *Recent Modifications of Prehistoric Chronology.*—The later progress in prehistorical research, which for the past generation has been increasingly rapid, has found it necessary rather to expand than to destroy the foundation laid down by the Scandinavian archeologists. The most fundamental addition has been that of the introduction of a fifth age, earlier than the Paleolithic, and including the great extent of time that has elapsed between the picking up the first stones with an intelligent purpose, and the acquirement of sufficient knowledge to shape them into the crudest form of paleoliths. To this age of dawning intelligence has been given the appropriate term *Eolithic* (Gr. Ἔως the dawn). During the first, and indeed the greater, part of this extensive epoch, sticks and stones, and probably also the bones of the larger animals, were awkwardly grasped by hands still accustomed to the boughs of trees, and

used quite as they were, without thought of bettering their shape; then, after this step was first taken, the improved implement did not at once become a paleolith, but there must have intervened a long period of time, during which these implements were purposely broken, with some attempt at shaping, but without resulting in any definite or constant forms. Most chronologists reckon this transition period with the Eolithic, yet a few propose for it a distinct place in the enumeration of the ages, and give it the name of *Archeolithic* or *Transpaleolithic*. A similar tendency leads some also to separate from the Paleolithic Age a short period of transition to the Neolithic, during which the implements were but partly smoothed, yet finely and carefully made; the *Mesolithic*, or *Transneolithic*.

Again, too, some wish to emphasize the introductory period in the use of metals, during which certain metals which occur free, especially copper, were worked much as if they were stone, and shaped on the anvil by beating. This stage probably preceded everywhere the use of *bronze*, the preparation of which demands not only the knowledge of both copper and tin, but the arts of fusing and molding. To this earliest of the metallic periods, in which, while men were still in the Stone Age, and used for the most part stone implements, a few metals were introduced, *although treated in every respect like stones*, the term *Cypriolithic* has been applied. Thus, while to the more conservative prehistorians the ages of human development may be still limited to five, it is also possible, and sometimes convenient, to extend them to eight. The comparison of these two classifications is as follows:

Chronology with five Ages Chronology with eight Ages

Eolithie.....	{ Eolithic Archeolithic
Paleolithie.....	{ Paleolithic Mesolithie
Neolithie	Neolithic
Bronze.....	{ Cyprolithic Bronze
Iron	Iron

Another modification, the result of the increase of our knowledge, has been the subdivision of each of these ages into *periods*, based upon certain characteristics in the implements found, and upon their relative age, geologically. These periods bear each the name of some locality in which typical deposits occur, usually the first known. Thus, the Chellean Period of the Paleolithic Age, is named from the French town of Chelles (Seine-et-Marne), near which occur deposits investigated by de Mortillet in 1887, and characterized by a certain low type of paleolith, unlike any previously studied. In chronological sequence, as deduced both from the local geological conditions and the types of implement, the Chellean Period seems to follow directly the Strépyan, a period named from Strépy in Belgium, and antedates by a little the Acheulian, a period established upon the French deposits at St. Acheul, in the valley of the Somme. It is to be anticipated that the number of these periods, and of the stages of human development which they represent, will be somewhat increased with greater knowledge, yet for the most part the implements found in localities newly opened up belong to periods already established, and thus, as with geological pe-

riods, the prehistoric sites found in any part of the world, or at least throughout Europe, where the conditions have been more thoroughly studied, can be considered as "Acheulian," "Mousterian," "Solutrean," etc., wholly in accordance with the types of implements found, without reference to the geographical location. In estimating the period of a given deposit, the geological conditions have a certain weight; yet it must be recognized that the various stages in human development were not necessarily passed through at the same time in all parts of Europe, and that, in the presumable isolation of one region from another, the men inhabiting one part of the continent might be in the midst of a Mousterian culture, while others had scarcely attained the Chellean or Acheulian.

While it is thus seen that, with the early inhabitants of Europe living in different grades of culture at the same time, and perhaps progressing at different rates, it is not wholly possible to form an absolute chronology in years for the successive periods of prehistory, or to reconcile them exactly with the various geological events of the Ice Age and afterwards, still many have attempted a general correspondence between the two sets of data. Upon the geological side the successive advances and retreats of ice, as given in Chapter I above, furnish a good background for dating the periods, especially as the bones of the successive faunæ, the relative dates of which are well known, are also usually found in the culture deposits, under circumstances which show the two to be contemporaneous. If, for example, a deposit contains flints crudely shaped, and also reindeer bones split for the extraction of marrow, the case is proven

that the men who made those flints used reindeer as food, and that the climate was such as was suitable for those animals. Actual sketches of the wild ox, the rhinoceros, and the mammoth carved upon bone, or sometimes upon mammoth ivory, have quite the weight of historical documents, and prove the absolute contemporaneity of these animals with the men who used the associated types of flints. In this way, by the combination of all possible evidence, both geological and cultural, by the study of the associated strata, and by the study of the artifacts, the successive periods of Europe prehistory have been made out, and synchronized with the geological events with sufficient certainty to allow a definite succession with relative dates. Such a chronological table of European prehistory is here presented, and it may serve both as a brief general survey of the total period of human activity so far as known, and also as a table of contents for the more detailed account given in the ensuing pages.

While the succession of prehistoric periods as given here is accepted with only slight modification by all prehistorians, there is still some difference of opinion concerning the synchrony of these periods with the geological events. By the study of both artifacts and the bones of the associated fauna it is generally conceded that the Mousterian and Magdalenian Periods of the Middle Paleolithic were mainly spent in a cold climate, in which cave dwelling was a necessity, while certain other periods, like the Solutréan, and perhaps the Chellean, show a warmer climate, and extensive plains, with residence in the open. Because of this some have placed the two first within the long period of the Wurm Ice, with an

hypothetical warmer time in the middle for the Solutréan, while others have even been inclined to push the Mousterian Period back into the time of the Riss Ice, with the Solutréan filling the warmer interglacial interval between this and the Wurm. This would put the Aeheulian and Chellean between the Riss and the still older Mindel Ice, leaving for the time of the Strépyan (pre-Chellean) activity the Mindel Ice itself. From this extreme antiquity, which is the farthest back ever proposed, modern investigators, led mainly by the French archeologist, Obermeier, have brought the Middle Paleolithic much farther forward, and placed the Solutréan just after the close of the Wurm Ice, and the Aurignacian and Mousterian within it. The cave life, and evidently cold climate of parts of the Magdalenian Period, are then explained as due to the lesser glaciations of the early Pleistocene, the Bühl, and the Gschnitz, bringing the transition periods (late Paleolithic and Neolithic) well on toward modern times, with the modern river systems already represented by chains of lakes.¹

¹ For recent attempts to establish approximate dates for the periods of European prehistory, and to synchronize them with the geological events, especially those of the great Ice Age, as established by Penck, cf. of the following: Boule, M.: "Observations sur un silex taillé du Jura, et sur la chronologie de M. Penck." *L'Anthropologie*, T. 19, 1908, pp. 1-13. Obermeier, H.: "Les formations glaciaires des Alpes et l'homme paleolithique." *L'Anthropologie*, T. 20, 1909, pp. 496-522. Schmidt, R. R.: "Der Sirgenstein und die diluvialen Kulturstätten Württembergs." Stuttgart, 1910. 47 pp.

A translation of several earlier papers by Obermeier (from *L'Anthropologie*, T. 16, 1905, and T. 17, 1906), together with the author's supplementary notes to date, is to be found in the Smithsonian Annual Report for 1906, pp. 373-397, with the title "Quaternary Human Remains in Central Europe." In this there appears a partial chronology, according to the author's

32. *The Eolithic Age; Characteristics of Eoliths.*—It is impossible to believe that even the crudest of the typical stone tools were invented all at once; that at a definite time men learned all at once to shape a piece of flint into the form of a definite tool, the use of which they were at once capable. Rather is it necessary to postulate a long period of time during which flints and other stones were used for such natural actions as prying, striking, and even cutting, as aids for the naked hand in the execution of their work. To this period of unknown limits, extending back to the earliest beings which could in any sense be called "Men," there has been given the name *Eolithic*, the Dawning Stone Age, and to the stones thus used but not purposely shaped, the term *eoliths*.

It must be conceded that any use of a stone that involves hitting it against other hard objects would, if sufficiently strenuous, cause it to be broken or cracked; it is further to be supposed that the effects of such treatment might be different from the effects produced by inanimate forces, like the jostling of stones in a rapid brook, the scraping of pebbles imbedded in the bottom of a glacier, or the action of waves on the shingle. These and other special effects geologists universally profess to be able to differentiate; it would thus be conceivable that stones used by human hands, and thus marked by numerous blows received during such usage, would have

ideas, and not very different from his later conclusions. In his latest papers Obermeier considers the Mousterian Period as continuing in part beyond the Wurm Ice, while Boule, without making the Mousterian so recent, makes the Solutrean and Magdalenian both post-glacial, the former occurring in the ice free interval after the retreat of the Wurm, and the latter experiencing the glacial conditions of the Bühl and Gschnitz.

sufficiently definite characteristics to allow their past experience to be also learned.

The use of flint for a tool or weapon, wherever anything was to be cut, for instance, would continually recommend its virtues in this particular to the naked feet of early man, and the picking up of such a flake after it had inflicted a deep cut on a man's sole, and turning it to use in cutting something else, would be but a short step even at the first. It would then be conceivable that a particular flake would be more easily and naturally handled in one way than in any other, leading to its being more usually taken into the hand in a definite manner. The part covered by the hand would thus be more protected while the blows would fall oftener upon the other portions, and if a second user were to attempt to work with the same piece he also would handle the piece in the same way, so that eventually one part would become well battered up, while the other part would remain smooth. This would naturally divide the entire tool; especially one repeatedly used, into two parts, the *manubrium* or handle, and the *percussion* or blade, the differentiation naturally following the use of the piece, entirely without conscious attempt at shaping it for any purpose. (Fig. 27.) Furthermore, if a flint nodule were found too large to be conveniently employed, it would easily be shivered into several more practical pieces for use by hurling it down upon another larger rock, an action that would not demand much special intelligence, or might be the spontaneous result of dropping a piece that was found unsuitable after being taken up.

Certain European localities have become noted for the

occurrence of more or less typical eoliths, and a few enthusiastic prehistorians have not only found there single tools, with manubrium and percussion, but have also discovered large masses shivered in pieces by being thrown in the manner described, or those from which



Fig. 27.—Manner of holding an eolith. The manubrium is the part most convenient to hold in the hand. This part is covered by the palm and fingers, and is thus protected from injury, while the tool is being used. On the other hand the exposed part, or percussion, being repeatedly struck, is thus chipped and battered. (After Forrer.)

flakes have been struck for the getting of smaller pieces. In fact, considerable discredit has been given to the whole theory of eoliths by the extravagant claims of their supporters, who not only see in them a marked degree of differentiation, but find them in sites that have origi-

nated too far in the past to have been possibly the work of creatures sufficiently man-like to have used them. Thus Rutot, the Belgian, has established eolithic periods like the Mesvinian, the Mafflian, and the Reutelian which

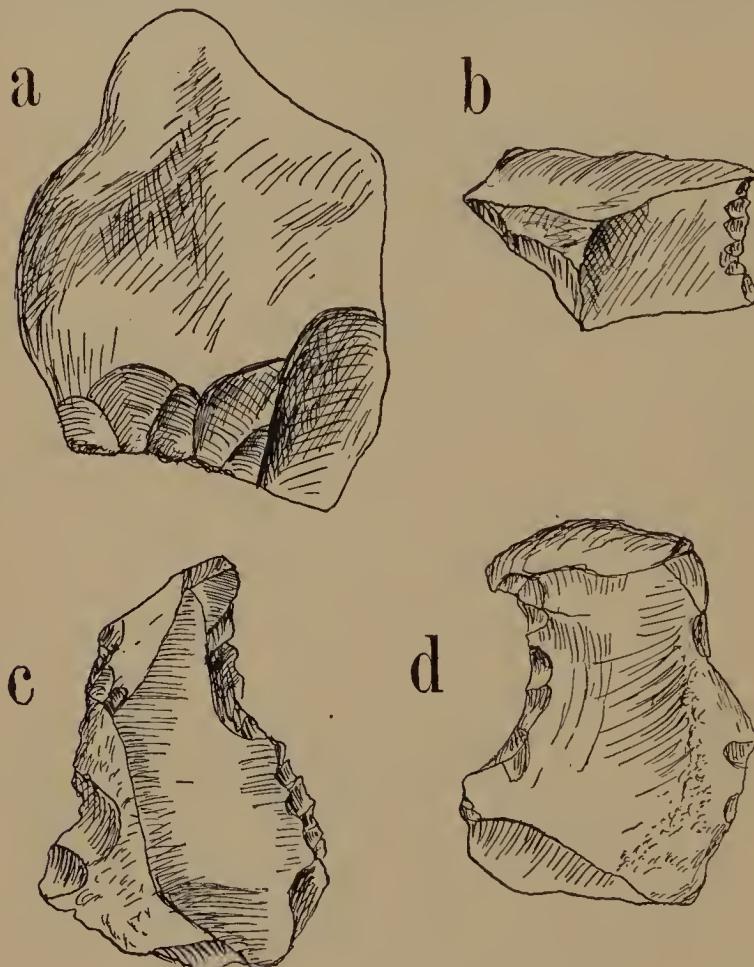


Fig. 28.—Representative Eoliths: (a) Typical form, with definite manubrium and percussion. From the locality St. Prest. (After Forrer.) (b) Eolith; Mesvinian deposit. (After Rutot.) (c) Eolith; Mafflian deposit. (After Rutot.) (d) Pseudo-eolith, formed as the result of pressure exerted by adjacent rock-masses. From the Oligocene locality of Boncelles. (After Verworn.)

take us well back before the Mindel Ice, but, not content with these, which are more or less probable, speaks of the Cantalian, a site in the Middle Miocene, and even of the Thenaysian, and the Boncellian, which are Oligocene, before the appearance of higher primates. The Cantalian, for example, is based upon flints occurring in the lava of the Miocene volcano of Cantal, in France, which has been styled "an eolithic Pompeii." This site lay originally upon the sands of a gently flowing river, in a luxuriant semi-tropical forest. A very rich fossil flora gave evidence, not only of firs, spruces and larches, of oaks, beeches and elms, but of the hickory and sassafras, now confined to the Western Hemisphere, as well as of the laurel and the bread-fruit tree. Here lived the three-toed horse, *Hipparrison*, the immediate ancestor of the elephant, *Dinotherium*, and the *Mastodon*, later to leave the Eastern Hemisphere forever. No bones of man or related forms are known from the site, but the sands are plentifully strewn with flints, in which Ruto sees typical eoliths of several sorts. It was at this time, the Middle Miocene, that the volcano of Cantal burst into activity, and covered the entire region with a layer of lava. (Fig. 28.)

It is claims like this, in which enthusiasts have seen true eoliths in Miocene times, that are apt to throw discredit upon the entire "eolithic theory," as some wish to have it called. Whatever we may think of the possibility of human or quasi-human activity at so ancient a date, it must be assumed that the first human users of flints employed them in a crude, unelaborated form, without intentional shaping, but whether it is always possible to detect this use, and distinguish

it in all cases as produced through human agency, is doubtful.¹

33. *The Users of the Eoliths.*—While the claims of the extreme advocates of the theory of eoliths may prove excessive; while the assumption of human intelligence as far back as the Oligocene, or even the Miocene, must be looked upon with suspicion; the later eoliths of Pliocene age, or after, may be generally conceded as marked by use, that is, as *artifacts*. They have been held in hands like ours, which have shielded a part of the surface while striking chips from other parts of the surface in the accomplishment of certain intelligent aims. But whose were those hands? Were they those of an intelligent ape; of an extremely low type of man; or of some form intermediate between the two? Have any bones or bone fragments of these animals, definitely associated with the eoliths, and in contemporaneous deposits, been found; and if found, what light do they throw upon the problem?

The Miocene deposits of Europe have yielded numerous fragments of an anthropoid ape, *Dryopithecus*, which gets its name "oak-ape" from the impressions of oak leaves found with the fragmentary jaw from which the species was named. This specimen was brought to light at St. Gaudens, in southern France, in 1856, but other remains of presumably the same species have been found in other parts of western Europe, notably a femur (at

¹ An excellent review of the indications of the existence of an Eolithic Age in Europe is given by George Grant MacCurdy in the *American Anthropologist* for July-Sept., 1905, pp. 425-479, with an extensive bibliography. This article deals sympathetically with what many anthropologists still call the "theory of eoliths," and includes the detailed classification of the Eolithic Age, as subdivided by the Belgian enthusiast, Rutot.

first named *Paedopithecus rhenanus*), found at Eppelshiem, on the Rhine. This ape, well suited to the semi-tropical forests of the mid-Miocene of Europe, was much like the gibbons of the East Indies, and could by no possibility have been responsible for the contemporary eoliths.

Certain teeth from a Pliocene deposit in the Swabian Alps, the "Bohnerz," seem considerably more human than those from the *Dryopithecus* jaw; other equally suspicious teeth have been found at Taubach, near Weimar, and in the Shipka cavern in Moravia.¹ These have all been the subject of much serious controversy, but it is now fairly well established that the Shipka teeth, which were in a small fragment of jaw, were much later than the Pliocene, and belonged to a child of the Neandertal race of men; and that the teeth from Taubach, also Pleistocene, instead of Pliocene, were those of the large European *Pan vetus*, from the Third Glacial Period.

The Bohnerz teeth, on the other hand, are really Pliocene, and although the discoverer, Branco, referred them to *Dryopithecus*, they seem more human. If they really are so, and are not those of some large ape, like the teeth from Taubach, they establish the presence in Germany previous to the final coming on of the ice, of a form sufficiently human to have used the eoliths. Although matters are still in an undetermined state concerning these, they are likely to be soon better understood, as has so frequently happened, in the light of future finds in this field.

¹ Branco, W. 1898. "Die menschenähnlichen Zähne aus dem Bohnerz der schwäbischen Alb." *Jahreshefte des Vereins für vaterl. Naturkunde in Württemberg*.

Although the European Pliocene gives but slight information concerning its contemporary man-like forms, and furnishes us with merely a gibbon and a possible chimpanzee, together with a bare suggestion of some intermediate form between them and man, the remains of a definite man-ape, or ape-man, contemporary with the European Pliocene, have been found in the island of Java, and it is not too great a strain upon our credulity to believe that either this form or a nearly related animal lived in Europe. This Javan animal or man was found in 1891-2 by a Dutch military surgeon, Eugen Dubois, and named *Pithecanthropus erectus*, the erect ape-man. The remains discovered consisted of a cranium, a femur, and several teeth, but they are precisely the parts most needed for description and comparison. This creature, with a low, retreating forehead, about intermediate between that of the highest apes and the lowest man, and with a projecting muzzle or snout, also intermediate in degree between that of the apes and man, walked perfectly erect upon long, straight legs, exhibiting human proportions. The cranial capacity of a gorilla rarely exceeds 500 cubic centimeters; that of the lowest type of modern man averages about 1200, and that of *Pithecanthropus* is estimated at 800. The femur measures in length 455 millimeters, the average length for a man of 1680mm (5 ft. 5 $\frac{3}{4}$ "), and, although the other bones are not known, we may assume about this height for the specimen found. From the cranial piece, which is complete as far in front as the eye-sockets, and from the teeth, the proportions of which gave the data for the dental arch, the entire skull was reconstructed by Dr. Dubois, and upon this as a basis a face

was moulded by Dr. J. H. McGregor, of Columbia University. This reconstruction, moulded upon the skull with careful attention to all anatomical details, gives a head and face curiously intermediate between one of the higher man-like apes and a low type of man; ridges project above the eyes, the cheek bones are broad and high, the nose is flat and extremely broad, and the mouth is very large. An ape's lips are always thin, without that outward rolling of the mucous surface so characteristic of man, especially of negroes; the lips of the reconstruction show a slight tendency to roll outwards, and are held a little open, disclosing the large simian teeth, with long canines. The head is carried far forward, and the neck muscles are so thick that there is scarcely any incurving at the nape. This gives the profile view of the restoration a much more ape-like appearance than the front view possesses.

Naturally such a reconstruction, resting as it does upon a restored skull, with few data for the face, and with none for such soft parts as nose and lips, ears and hair, must be at best a recapitulation of scientific conclusions, yet, considered as such, it is of value in the same way as is a working hypothesis, a structure built up from the material as far as known, and expected to be modified here and there, and to be eventually remodeled, according to data that may later present themselves. Thus viewed, a reconstruction like this, which expresses every detail that is known or can be deduced from what is known, becomes even to the specialist a work of great value; and for those who are not professional anatomists, and who have therefore not the power of interpreting fragments, it furnishes a translation from

scientific deductions into plastic form, easily understood by all.

34. *The Period of Strépy; the Transition to the Palæolithie.*—While during the long ages that stretch between Cantal and Mesvin, if we may believe the testimony of eoliths, there was no perceptible advance in human activity, important changes took place in the associated animals. This is especially well seen in the succession of huge Proboscidians, adapted to the various changes of climate to which the continent was subjected, and often found in close association with the remains of human activity. Throughout the Miocene this group of animals was represented by the *Dinotherium*, not yet an elephant, but strongly suggestive of that later specialization. This form gave place in the Pliocene to the first of the genuine elephants, *Elephas meridionalis*, fitted to a warm climate, and which in its turn yielded to another species, *Elephas antiquus*, at about the time of the Mindel-Riss Interglacial Period. Bones of this latter animal were found, together with the eoliths of the station at Mesvin, in Belgium.¹ But these two southern animals disappeared at the advance of the Riss Ice and there came in their stead the mammoth, *Elephas primigenius*, destined to be long the companion, if not the actual friend, of early man; to furnish him with ivory for the manufacture of valuable tools, and to serve as a favorite model for his growing artistic talent. And with the advent of this huge associate of man, with its rolling tusks and long masses of coarse hair, there came into the long Eolithie night the first ray of

¹Opened up in a railway cutting between Mons and Harnignies.

dawn, the first sign of the action of a really human intelligence.

This advance consisted of nothing more than a slight change in the stone artifacts found in the deposits of the period; the first crude attempts at shaping the pieces in such a way as to be better suited to their purpose. The earliest site at which such flints have been found is at Strépy; in Belgium, from which the period itself, immediately following the Mesvinian, is designated as the Strépyan; and furthermore, as the flints, thus crudely shaped, are no longer typical eoliths, yet too slightly worked to be called paleoliths, the term *archeoliths* has been proposed for them, and the Strépyan period, with perhaps others to be established later, may be made to constitute an Archeolithic Age, inserted between the Eolithic and the Paleolithic. The date of this initial activity in the manufacture of tools is usually placed chronologically during the third great glacial advance, that of the Riss Ice, and the men of Strépy must have inhabited the extensive regions which escaped glaciation, running up through Europe in several places.

Thus at this time, at a period seemingly most unfavorable for advance, the first step was taken along the upward road leading beyond the eoliths in the direction of the improvement of existing conditions. This step was not a great one. Only a specialist could perceive it. None but an expert, working over a collection of primitive stone implements could point out the difference between the typical eoliths and one which had been slightly improved, yet the latter, and the latter only, shows the *results of impacts purposely struck upon the stone, not incident to the use to which it was put*,

but dealt for the sake of improving the shape of the tool and fitting it better for its use.

Poor enough were these attempts, confined to the striking off an awkward corner or inconvenient projection, yet these very acts inaugurated a revolution, not merely in tool making, but in ethics as well. A stone thus elaborated and improved became straightway unlike others. It possessed an intrinsic value greater than that of the unelaborated stones. It belonged to the man who had thus shaped it. It was his personal possession. No longer now is the stone hurled aside when once the immediate result is accomplished. It has shown itself to be better fitted for its purpose than other stones, and is thus retained by the artificer as a thing of special value. He takes it with him to his rude rock-shelter, and hides it in the moss, or perhaps among the dry leaves that form his bed. On leaving the cave at sunrise he takes it with him, and may eventually elaborate some device whereby it may be attached to his body, and leave his hands and arms free for action.

Thus the first ideas of values, of the rights of possession, of individual property—the initial acts in the long drama of man-making—developed spontaneously in that lonely valley where the glaciers of the Riss Ice groaned and crashed. Feebly developed along the line of intelligent purpose as that animal brain must have been, it has yet devised this first step toward civilization; it has executed a definite purpose with those hairy Simian fingers; it has made its first real possession. And with this comes a new experience: the burden of property. Henceforth this tool must be kept; looked after; if need be, it must be fought for. This first forward step

It must not be supposed from the words that this fine
man, in reality important for all purposes, deserved
such place as one we only, and that the idea of
keeping such fine place here, this initial discovery
was made. With the same sort of organization, as
a sort of interclass relation, we can adjust our in-
come, and so on, we could be raised to just by the
means of a single family or not, we could immediately
adjust our individual, and it could be done now for
any of us, and so on, we have been made, independent

ently, over and over again by different men, all through this time, perhaps even through this entire Ice epoch, before this *Strépyan* culture had become universal, even in Western Europe.

Types of artifacts, precisely similar to the ones found at *Strépy*, have recently been recognized among the gravel deposits of the river Somme, where are found also the typical implements of the Chellean and Acheulian Period, but distinct from, and older than, either. Upon the basis of these deposits, with their characteristic artifacts of the crudest nature, Commont has recently established his Pre-Chellean Period, but a comparison of the Pre-Chellean artifacts, with those from the deposits of *Strépy* show the two to have been the same. The glimmerings of the light that characterized the deposits at *Strépy* are thus seen to have been spread over the neighboring countries at about the same time, and throughout western Europe preparations were slowly being made for the more definitely formed artifacts of the early Paleolithic.

As for the bodily appearance of the creatures who made this advance, and by so doing first earned the right to be called "Men," we have, in the testimony already presented in the form of actual bones, two possible candidates. One of these is the Heidelberg Jaw; the other consists of the Piltdown cranial fragments. The first, practically the jaw of an ape, but with teeth of the human type, suggests the Neandertal man of later times, and is generally considered the direct ancestor of that type, but a little less human. This Heidelberg man was undoubtedly an eolith user, and was perhaps responsible for the contemporary Mesvinian artifacts. The second,

from Piltdown in Sussex, comes apparently from the time of the Riss Glaciation, contemporary with Strépy, and was found in close connection with flints of the Strépyan type.

The skull fragments, of which the Piltdown remains consist, are unusually thick, but otherwise indicate a cranium, which, though of a low type, is considerably more like that of modern man than like that of the Heidelberg-Neandertal race. A jaw, found with the other fragments, and supposed at first to be a part of the same individual, is thought by many to be that of a chimpanzee (*Pan vetus*), living in England at the same time; but the English specialists, who have had the advantage of working over the original fragments, are firmly of the opinion that both the jaw and the cranial fragments belong together.

Perhaps, during the last part of the Eolithic Age, and also during the Archeolithic, there lived two human types. One had a low cranial vault, heavy ridges over the eyes, and no chin, the direct ancestor of the Neandertal race; the other was suggestive of the modern type of man, without accentuated brow ridges, and possessed a fairly high cranial vault, yet lower in cranium and brain than any recent race. During this time, also, the first improvements of the long used eoliths may have appeared. More than this we cannot as yet say, nor have we basis for even hypotheses. This is a definite hiatus in our past history, to fill which we must wait for more data.

35. *Early Paleolithic Times; the Chellean Period.*¹—

¹ The Chellean Period received its name from the town of Chelles (Dept. Seine-et-Marne), France, 15 kilometers east of

The step inaugurated during the epoch of the Riss Ice, that of shaping a tool to suit its purpose better, was soon to bear fruit, as is seen in the artifacts of the times immediately succeeding the retreat of the Riss glaciation, for here we find *the first definitely shaped tool*, at least from our standpoint—a moderately large implement possessing a crude sort of blade with a rough zigzag edge.

In proportion to the long ages of the Eolithic, the advance from the first shaping of a flint to the production of even this crude implement is very rapid, and may suggest the appearance by a migration of some more intelligent being than has hitherto inhabited Europe; yet the transition from the areheoliths of the Strépyan to so primitive a tool as the "Chelles axe" is after all a slight one, and after the idea of shaping a flint is once inaugurated the improvement could be easily effected.

The most typical Chellean artifact is the hand-axe, or "coup-de-poing," intended to be held in the hand, i. e., used without a handle. One end is designed to be grasped, and is therefore left unchipped, and frequently retains the original crust characteristic of a natural flint nodule. Beyond this comes the blade, which is entirely covered by concavities caused by rude flaking, and is thus wholly artificial. *Around this portion runs a sharp edge, which is a pronounced zigzag, caused by the striking off of large flakes from the two sides alternately.* This zigzag edge is the special characteristic of a Chelles

Paris, where the artifacts occur in the old river terrace gravels; but similar deposits, undoubtedly contemporaneous with these, have been found in other parts of Europe, and have yielded precisely similar implements.

axe, as the workmen of that period found no way of making the edge straight (Fig. 29). An examination

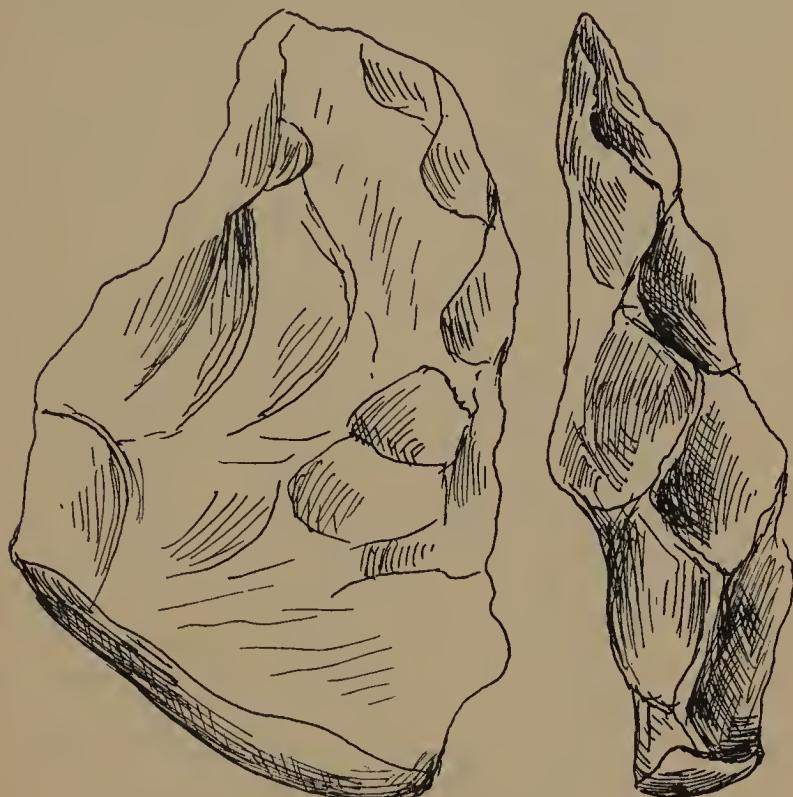


Fig. 29.—Two views, side and edge, of a typical Chellean axe, a "Coup-de-Poing," intended to be used in the bare hand, without handle. For this purpose the lower end is thick, and often still bears the original smooth crust, while otherwise the entire surface is elaborated, i.e., covered with artificial flakes. Note especially the zigzag edge, caused by large flakes, struck off alternately from the two sides. This is the most striking type of Chellean workshops, as the men of this time had not yet learned to make a straight edge. (From a specimen in the Smith College Collection. One-half natural size.)

of many specimens with a view to finding possible indications that these axes were ever mounted in a handle has resulted negatively, and we are led to the conclusion that no such improvement as a handle had as yet appeared.

Aside from these characteristic axes, Chellean deposits furnish no other artifacts that may be definitely termed "paleoliths," but yield numerous flints of archaelithic and eolithie types, which seem also to have still been in common use. This occurrence of implements of cruder form with those of more finished workmanship is always usual in deposits of all ages, and among such primitive modern peoples as the Australians, archeoliths and even eoliths may be found still in use.

Chellean eoliths, however, show a slightly greater degree of differentiation than those found in true eolithic deposits, and among them occur small sharp splinters, apparently used as points, stuck into sticks, and used as javelins or spears, crude forms of missile weapons. Thus the arrow may be said to have much antedated the bow, for which it inevitably prepared the way, since its use as a hand javelin would lead to some mechanical method of propulsion. There thus developed various types of throwing-sticks, which appeared during the next two or three periods. The bow, based on a different principle, was much later, almost Neolithic in date.

36. *Early Paleolithic Times; the Acheulian Period.*—The flints of the Acheluiian Period, named from the type locality of St. Acheul, in the valley of the Somme, in Northern France,¹ show a considerable advance in several directions. An axe made on the Chellean model as

¹ This site is rendered famous for all time as the scene of the labors of M. Boucher de Perthes, a pioneer in European prehistory, who worked in the deposits here between 1845 and 1865, and whose results were received with general disbelief. For a recent paper on the same locality, giving the results of new excavations, in which are distinguished the deposits of the Pre-Chellean, Chellean, and Acheulian Periods, cf. Commont, in *L'Anthropologie*, T. 19, 1908, pp. 527-572.

regards form and size, commonly occurs, but shows important differences in three distinct ways:

(1) The entire surface is rendered smoother by the use of finer flakes, (2) the edge has become straight, and

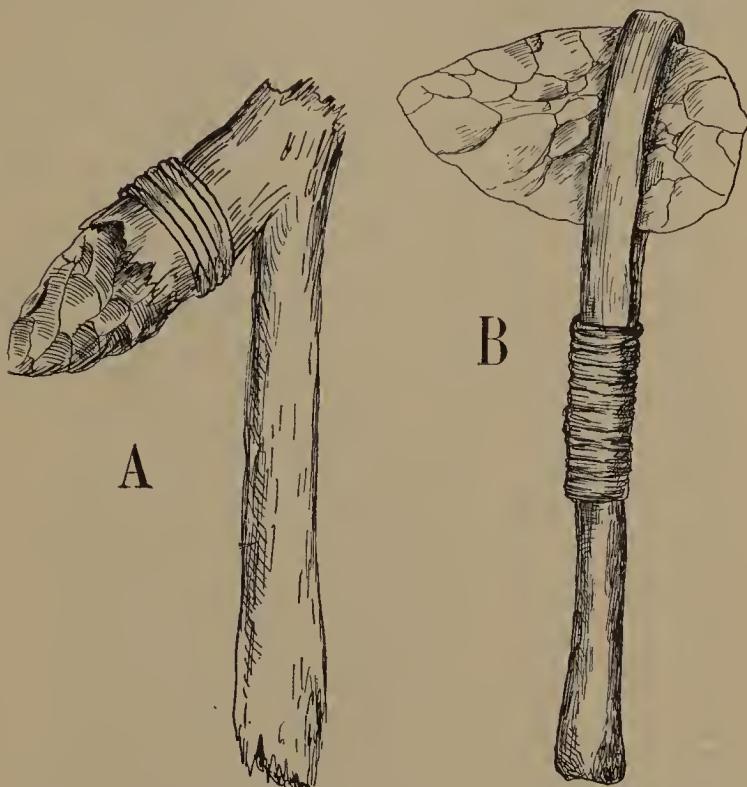


Fig. 30.—Two ways in which an Acheulian axe may have been mounted. From methods actually in use among primitive people at the present time. B. is taken from Forrer, and represents an Australian method.

(3) it runs around the entire tool, thus rendering it unlikely that it could have ever been used by holding it in the hand. Naturally no handles, which were undoubtedly of wood, or wood and leather, have ever been found, but several possible methods may be suggested

by the study of those still in use among modern primitive peoples, some of which are suggested here in Fig. 30. In A the natural angle of a tree limb is taken into account, and the flint is pushed into one end, probably that of the larger piece. Every blow with the implement tends to wedge the flint more firmly into the handle, while a tendency to split is counteracted by winding the wood, just below the insertion of the axe, with a stout thong or sinew. B, after Forrer, shows the Australian method for hafting an axe very similar to the Acheulian type, and still used by them. It consists essentially of a pliant piece of wood bent in the form of a loop by bending it upon itself, and perhaps softened by boiling. The loop is just a little smaller than the largest width of the flint.

Aside from typical Acheulian axes, various other types of implements occur, showing a gradual perfection of the paleolith. The idea inaugurated at Strépy, that of purposely shaping a flint to a given use, has already borne much fruit, and the intelligent progress of early humanity, and the gradual precision in the education of the muscles of the arm and fingers, are marked by the increase in the number of forms of artifact as well as in the better workmanship and the straighter and sharper edges.

The Acheulian Period, like the Chellean, was a long one. During this period the great ice sheet, which throughout the Chellean was confined to the Far North, had again slowly advanced, and covered the Alps and other high-lying areas, ushering in the last of the major great glacial advance, that of the Wurm Ice. The users of the flints, now long accustomed to life in the open air, or in frail shelters made of intertwined branches, began to betake



Fig. 31.—Typical Acheulian axe, made by rather large and coarse flaking, but with the edge straight, and not zigzag, as in the earlier forms. As this figure is but one half the natural size, it is seen that this implement is rather large. (After Obermeier, in *L'Anthropologie*.)

themselves to caves and recesses of the rocks, or sheltered themselves from the north winds beneath overhanging cliffs. These they reinforced by skins or crude thatch, the *abris-sous-roches* of the French anthropologists.

This change of climate affected, not man alone, but the entire fauna. The Chellean rhinoceros, *R. merckii*, disappeared, and was replaced by a similar beast, *Rhinoceros tichorhinus*, whose skin was clothed with a thick wool. Within the shelter of the forest were found the ancient European ox, *Bos primigenius*, and the great elk, *Cervus megaceros*. Vast herds of reindeer were soon to come down from the north, and spread out over the frozen plains, and the wooly mammoth, *Elephas primigenius*, was soon to present himself as a model to the paleolithic artist.

This advent of northern animals formed the vanguard of the fourth great glaciation, the Wurm Ice, which, according to Penck, appeared in mid-Europe about forty thousands years ago, and lasted some twenty thousand more. With its retreat, at this date, comes the end of the Quaternary, as usually considered, but still after this three Pleistocene glaciations follow in succession, so that the Middle Paleolithic, which begins with the Wurm Ice and extends through four prehistoric periods, and ends with the glaciation of the Gschnitz, was characterized mainly by being a period of cold climate. For man it was largely a period of cave life, and of hunting arctic animals over the steppes and frozen bogs.

Yet, after all, with all its disadvantages, it was in many respects the greatest and grandest in human history, for during this time man became man, endowed with arts

and industries; he had killed or driven forever from Europe the worst and fiercest of the carnivores, his most dangerous enemy. In the darkness of the Wurm Ice he entered the caves with his Acheulian axe in his hand, as yet his only masterpiece; he left them equipped with numerous sorts of implements, of stones, of bone, of ivory. He had learned to carve bits of bone or ivory into the likeness of the animals with which he was familiar; he had learned to sketch incised lines on the walls of his cave giving strikingly accurate outlines of the wild ox, the reindeer, the mammoth, and the horse, and he had painted them in lifelike colors by means of variously colored earths and powdered stones. He had acquitted himself gloriously throughout his long ordeal of initiation, and after the final retreat of the last general ice sheet, came forth into his full manhood upon the newly reclaimed earth.

37. *Middle Paleolithic Times; the Mousterian Period.*

—This first of the four periods of the Middle Paleolithic takes its name from the caverns of Le Moustier, in the valley of the Vezère, southern France, and situated a few miles above the little village of Les Eyzies (Dordogne). Here, upon a slope which lies in terraces, occur four small grottoes, hardly more than rock shelters, placed in nearly a straight line, one above the other. Of these the uppermost has yielded practically nothing, but the others, especially the lowermost one, contain rich paleolithic deposits. The implements found here show, in strict accord with the relative age of the layer in which each occurs, an almost unbroken line of development, beginning with those of the late *Acheulian Period*, which are the same as those of the same period elsewhere, and

continuing throughout the succeeding *Mousterian Period*, which evidently lasted for a very long time. Here they developed a number of characteristic types of im-



Fig. 32.—Typical Mousterian hand-axe, of triangular shape, with a straight edge which has been retouched. Two thirds natural size. (After Commont, in *L'Anthropologie*.)

plements that show a considerable advance on the Acheulian. Thus, while the Acheulian type of axe was still in use, and occurs in most Mousterian deposits, this lat-

ter period developed also a type of its own, the *Mousterian axe*. This is triangular in form, rather broad at the base, which is left in an unfinished state, while the two sides and the point are sharpened with great care.

A second type, somewhat similar to this, but smaller, is the *Mousterian point*, specimens of which occur in great numbers in deposits of this period. These points are flattened triangles of flint, with the apex and the two adjacent edges worked down by very fine retouching and carefully elaborated, while the base is left rough. These points may have been mounted in the ends of sticks, and perhaps fastened in by fibres of bast which could be wound tightly around the end of the shaft; the weapons thus made could serve either as spears or javelins to be hurled from the hand, or as lances or daggers to be held firmly, and used to thrust with. Similar weapons seem to have been in use even in the Chellean period, but here the points used were chance splinters that resulted from breaking larger pieces, that is, typical eoliths, while the Mousterian points were carefully elaborated tools, made designedly for a definite purpose.

The art of *retouching* the edges of a tool or weapon, mentioned above, first appears in the Mousterian, and is often seen in artifacts of this period. It consists of one or more rows of small flakes, upon the very edge, and confined to the convex side. By means of these the straight, though rather blunt, edge produced by the coarser chippings, done after the Acheulian method, can be brought down to an extremely sharp and delicate one. Beautiful examples of retouching are frequently seen on the stone arrow points of the North American Indians,

who have thus brought up to the present a technique started in the late Quaternary.

In another point this Mousterian Period marks a distinct advance upon all preceding times; and that is, it exhibits the first use of bone as a material from which to make tools. In their best form they appear as pointed

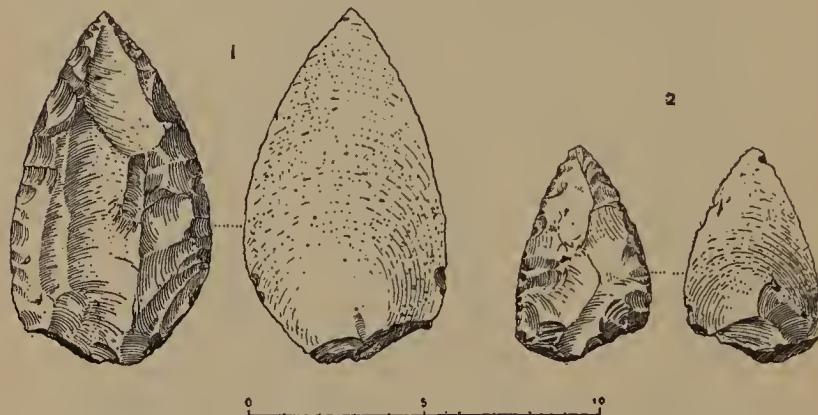


Fig. 33.—Mousterian points; each is made of a medium sized, or large flake, struck off from a flint nodule, with one side elaborated, while the other side is left untouched, simply showing the lines of the original blow which separated it from the original nodule. The elaborated side shows, not only a finer flaking than is seen in the axes of Chellean or Acheulian workmanship, but the edges, especially toward the point, are retouched—that is, flaked along the edges with a row of very small flakes, evidently the last strokes made in finishing the implement. These "Mousterian points" were evidently set into long sticks, and used as javelins thrown by hand, or as arrows, propelled by some sort of throwing-stick. The bow, as we know it, was not devised until very much later, perhaps during the transition period between the Paleolithic and the Neolithic. (After Déchelette.)

implements, perhaps the very tools used in making the fine retouching flakes for elaborating the edges, but of this we are uncertain. More frequently are found typical "bone eoliths," that is, bones or pieces of bone, not intentionally shaped as tools, but used just as they were for various purposes, leaving, as in the case of stone eoliths, the marks of use, being scratched and dented by the objects with which they came in contact. That these

scratches are not simply the chance marks made by a flint scraper in getting the meat off is shown, not only by the concentration of them upon a definite region, but also by the fact that this region is always the exact spot where such scratches would occur if the bone were grasped in the most natural way, and used for ordinary purposes.

The Mousterian Period seems to have lasted a very long time, and the Mousterian cult is recognized in deposits found in many parts of Europe.¹

The quest of caves and rock shelters, as shelters from the advancing cold, which was characteristic of the end of the Acheulian and the beginning of the Mousterian, precipitated a conflict which seems hitherto to have been avoided, and brought man face to face with a formidable rival, already in possession of these very retreats, the huge cave bear, *Ursus spelaeus*. Against this foe, the counterpart of, or perhaps identical with, the grizzly bear of the Rocky Mountains, with no weapons more formidable than crude stone axes and pointed javelins, man proceeded, and, as the result of his intrepidity and cunning, actually dispossessed this huge beast of his long-inhabited caves. As an eloquent testimony of this struggle there may now be seen in the prehistoric museum at Trieste the skull of a large cave-bear, with the greater part of a Mousterian axe set in the right temporal fossa,

¹ Important Mousterian sites are those of Taubach, near Weimar, and Achenheim, near Strassburg, in Germany (the latter perhaps Aurignacian); the grotto of Wildkirchli in Switzerland; several Austrian localities, like that of Willendorf, near Vienna; and perhaps Krapina, in Croatia, although this latter site may be a little more recent, and belong rather to the Aurignacian Period.

deeply imbedded in the side of the frontal bone. The blow must have been dealt at close quarters, as the axe was not a missile weapon; and the strength of arm of the intrepid hunter drove it directly through shaggy hair, skin, and tough temporal muscle, until it reached and nearly penetrated the heavy skull. Terrific as was the blow, the bear yet recovered and lived for many



Fig. 34.—Skull of a cave-bear (*Ursus spelaeus*), found in a cavern at Nabresina, near Trieste, and bearing on the right side, in the parietal bone, a Paleolithic stone axe of the Mousterian type. The axe had almost cut through the bone, but the latter had grown firmly around the flint, showing that after the wound the animal had survived, probably for many years. As an axe is not a missile weapon the blow must have been delivered at close quarters by a man with sufficient courage to have withstood the attack of this huge beast, and with sufficient coolness to deliver the blow at exactly the right time and in precisely the proper spot. This skull is now in the Museo Civico in Trieste, and serves as an eloquent proof of an actual encounter between early man and the worst of his adversaries. (After Marchesetti.)

years, finally dying in a cave always retained by his race, where although the remains of nearly three hundred bears have already been found, no other signs of contemporary man occur, except this axe.

Other large animals associated with Mousterian man were the mammoth (*Elephas primigenius*), the wild horse, the large wild ox or "Ur" of the Germanic leg-

ends, the bison and the woolly rhinoceros (*Rhinoceros tichorhinus*). The reindeer and arctic fox appeared in the middle Mousterian Period, and during the Aurignacian Period, immediately ensuing, at the height of the cold, and just before the final retreat of the ice sheet of the Wurm glaciation, there came the musk-ox (*Ovibos moschatus*), sure sign of an almost arctic climate. Osborn suggests that there was probably to some extent an annual migration of the fauna, and that the extreme northern forms came south in the winter months, while during the summers, which are long in these latitudes, there were occasional visits from the more southern *Elephas antiquus* and Merck's rhinoceros, remains of which are occasionally found in Mousterian deposits. All of these indications of cold climate are best accounted for by placing the Mousterian Period as coincident with the Wurm Ice, with its several fluctuations, thus making the open Solutréan coincide with the previous glacial retreat. The resumption of cave life in the Magdalenian may thus be accounted for by the coming on of the minor glaciation of the Bühl. Some authors, however, shift the Mousterian a whole glaciation further back, making it coincide with the Riss Ice, instead of the Wurm, with the Solutréan during the Riss-Wurm interval, and the Magdalenian in the Wurm glaciation.

The man of the Mousterian was not the present species, but the species first known to us from the skeleton of the Neandertal cave, and hence called *Homo neandertalensis*. The bones, which are now well known in both sexes, portray man-like form of very stout build, with large chest and powerful forearms; with short legs and probably with the soles of the feet somewhat turned in, as in

the large living apes and in the infants of the present human species. The neck was very stout and short, the better to support the head, which was of enormous size. The teeth were large, the muzzle protruded, but was without a projecting chin, and the large eye sockets were protected by heavy supra-orbital ridges, which met in the middle and formed a transverse shelf over the eyes. Our whole picture, presented in greater detail elsewhere, is that of a stooping figure, with bowed back and bent legs, probably more active in climbing trees than any living human race, yet spending the most of his time upon the ground; in short, sufficiently distinct from modern man to constitute a distinct species.

38. *Middle Paleolithic Times; the Aurignacian Period.*

—To the moderate warmth which characterized the latter part of the Mousterian Period succeeded a time of dampness and cold, probably one of those minor fluctuations characteristic of the waning centuries of the Wurm Ice epoch. While over the level steppes of the river valleys enormous herds of wild horses and mammoths still wandered, the reindeer from the north became more frequent, and the presence of such animals as the Alpine gopher gives further indication of the changing climatic conditions. The typical deposits of this period occur in the shallower grottoes, or *abris-sous-roches* of Aurignac, in southern France (Haute-Garonne), but similar deposits are found also in Belgium, Germany, and Austria, always with the same types of artifacts, and associated with the same arctic fauna. Yet, in spite of the unpropitious climate, and the privations in life indicated by the enforced shelter in caverns and beneath overhanging rocks, a most noteworthy advance was made in Euro-

pean culture, for there appeared at this very time the first representatives of the modern species of man, *Homo sapiens*. The locality where the first of these skeletons were found was near the village of Cro-Magnon, on the river Vezère, but similar skeletons of this period and type are now known from several other parts of southern France, especially Mentone and the adjacent Italian soil, just across the border. The majority of the skeletons found here are those of the Cro-Magnon type, but among them was found a double grave, containing a woman and a boy of pronounced Negroid type, and racially distinct. These were established as the types, and thus far the only representatives of the "Grimaldi Race," the name taken from the family name of Albert, Prince of Monaco, under whose leadership the excavations took place and upon whose territory the graves were found.

A skeleton, unearthed at Combe-Capelle, in Perigord, in 1909, has been made the type of a third Aurignacian race, or even of a new species, perhaps intermediate between the Neandertals and the modern species, *Homo aurignacensis*. This extreme view of specific distinctness is not generally held, but this skeleton of Combe-Capelle seems at least a distinct race from the Cro-Magnons, as it is short in stature, about five feet, three inches, while the average male Cro-Magnons was six feet, one and one-half inches.

With the coming of these new human types, probably all representatives of the new species *H. sapiens*, there are associated the following advances in the culture of the period: (1) new types of stone artifacts, (2) artifacts of bone, some of them definitely shaped for use as tools, and (3) the appearance of incised drawings and

of carvings, representing associated animal forms. Perhaps, too, may be mentioned as (4), the final disappearance from the earth of that sturdy race, the Neanderthal folk, whose valor in exterminating the cave bear seems mainly to have availed in making the country more habitable for their usurping successors, whose appearance in Europe was very likely the chief reason for their rapid extinction. *Sic vos non vobis!*

Flint artifacts from Aurignacian culture layers are not fundamentally different from those met with in the Mousterian, that is, they are the tools of flint users in the Paleolithic stage of development. Collections of Aurignacian artifacts are, however, notable from the number of small instruments made apparently from

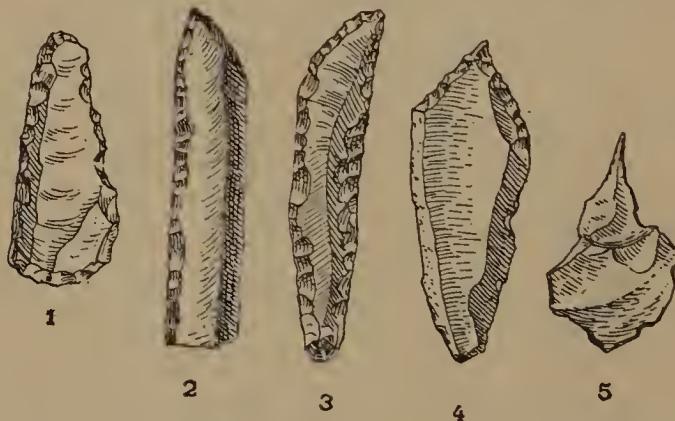


Fig. 35.—Small stone implements from Aurignacian deposits. (1) Scraper; (2, 3) Knife blades; (4, 5) Borers. (After Déchelette.)

chance flakes, yet worked down to points and with retouched edges, forming tools called "burins," and used in the production of the fine engravings also characteristic of the period. Some of these are remarkable for their small size, plainly indicative of the men who used them,

who could perform easily and continually certain precise motions entirely beyond the best which the Neandertal men could do, as shown by the large, coarse artifacts of previous times.

The same degree of skill is also shown in the delicate implements of bone, horn and ivory, more characteristic of the two following periods, yet not wanting in the Aurignacian, and especially in the statuettes or figurines, the earliest of which are of Aurignacian age. In this connection, however, one involuntarily thinks of the "bone-eoliths" of the previous period, undoubtedly the work of the unfortunate Neandertal people, which, after the analogy of the flints, indicates the beginnings of an art in which the newcomers so easily excelled.

Concerning the land of origin of this new Aurignacian culture, an Asiatic origin is rendered unlikely from the fact that practically all the Aurignacian deposits occur in south-western Europe, and that through the eastern part, bordering upon Asia, nothing of this form of culture has been found. Aside from this much of the best Aurignacian material has been found near the border of the Mediterranean, a position which would strongly suggest Africa as the land from which *Homo sapiens* entered Europe. The differences, both in culture and in physical character, between him and his Neandertal predecessor, especially the latter, render a development in place well nigh impossible. The Neandertals were short of stature, averaging about five feet, three inches in height; the Cro-Magnons were giants, the males ranging from five feet, ten inches, to six feet, five inches. The arms and legs of the first were short; those of the second disproportionately long. The men of Cro-Magnon pos-

ssessed an erect carriage; those of Neandertal carried their heads forward, and walked with their knees habitually a little bent, and had curved thighs. In the face the two showed striking differences, certainly great enough to establish specific difference between the two, perhaps sufficient to rank them as separate genera. The large head of the Neandertal man, with its overhanging supraorbital arches, its slanting forehead and low cranium, and its lack of chin, must have contrasted strongly, when in the flesh, with the equally ponderous head of men of the Cro-Magnon, with their smooth brows, high, straight forehead, and firm, prominent chin, raised upon a lofty and erect body. It is no wonder that, as Osborn has pointed out, there was no mating between the two, and consequently no transition forms. The giant from abroad, with his superior culture and physical ability, must have looked upon the sturdy but dwarfish Neandertal, with his beetling brows, as little better than an ape, and as such the latter was probably hunted like an animal, leading to his speedy extermination. Whether or not the work of the men of Cro-Magnon, the Neandertal species disappears at this point in our history, and leaves no descendants.

Through this sudden substitution of one species of man for another within a comparatively short interval, resulting also in a change of activities and industries, we see that not all prehistory chronicles a continuous evolution of one strain; we realize also that not all cultural development took place in Europe, or is represented in European deposits. The earlier history of our species, first represented in Europe by the men of Cro-Magnon some forty thousands years ago, is still unknown, and

must be sought in that yet unknown land of their origin—western Asia, perhaps, or northern Africa. In Europe this Aurignacian Period represents a wide hiatus; and the men, whose gradual evolution we are permitted to trace upward from coliths and archeoliths, and through the record of the Heidelberg jaw and the Piltdown fragments, were not permitted to complete their long labor, but “unwept for and unsung” laid in the dust their erude axes and their missile weapons, hand-hurled and ineffective, before the superior intelligence of the modern racee.

39. *Middle Paleolithic Times; the Solutréan Period.*—The period of Solutré is cast in different scenes from that of the preceding. The great Wurm glaciation has evidently retreated to the far north, and laid bare extensive plains or steppes, such as are found now in central Asia. In the cold and dry climate with which the Pleistocene times opened, man came out of his caves and lived throughout the period more in the open; and with the impetus afforded by the vast herds of reindeer and of wild horses, which covered the plains, became a wandering hunter. Thus the artifacts of the time show great advancees in implements of the chase. From the predominance of the bones of the horse among culture deposits of this period it is plain that this animal formed the principal food, and from this circumstance the Solutréan Period has been termed the “Wild-horse Period.” The animal was, however, hunted entirely for food, and ages were yet to elapse before there is found a bit or a curb, or the fragment of a chariot wheel, to indicate its conquest and enslavement in the service of man. Fleet of foot, and easily apprised of danger, the wild horse is

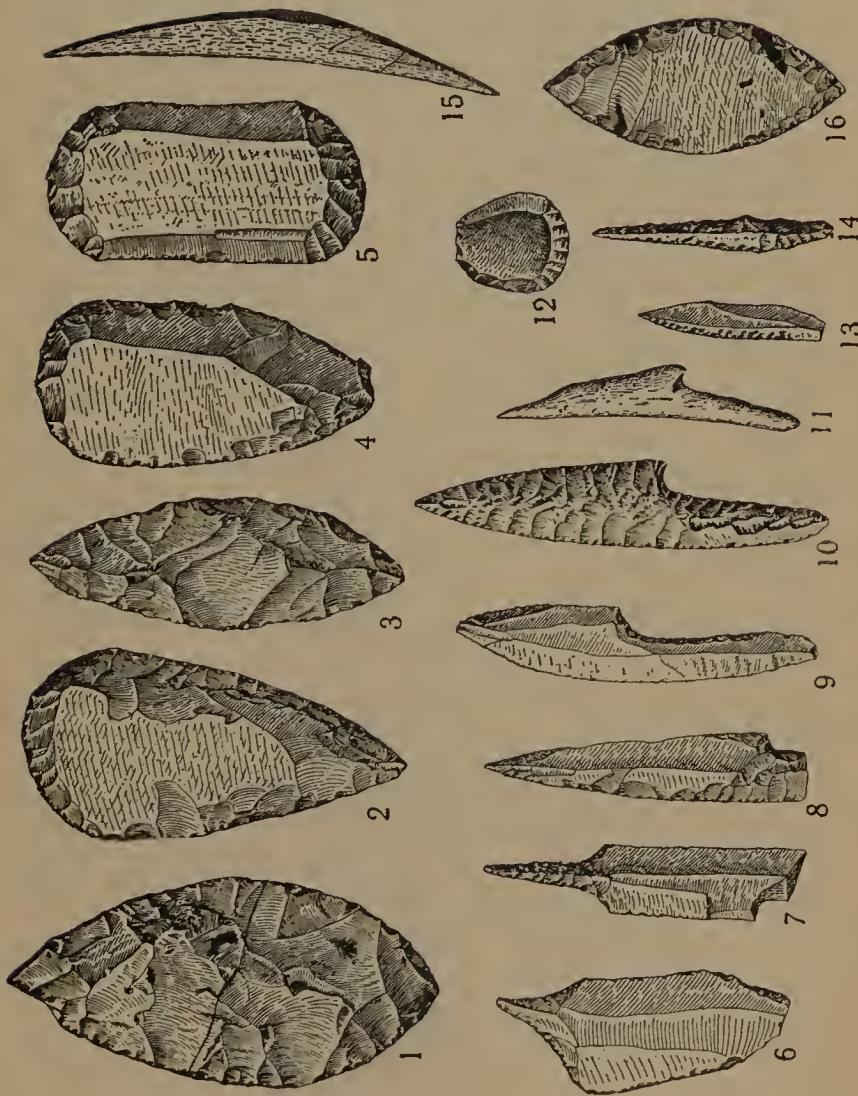
not easily caught alive, and not only wit, but courage, was needed to first bring down this noble quarry.

There are also plentiful suggestions of subtle means of gaining supremacy over the beasts such as pitfalls, traps and snares, by which man matched his cunning with that of his victims; and if we may judge from an indistinct sketch on ivory, dating from this time, the lasso also may have been used. Since, moreover, these means often furnished the animals alive, the opportunity of taming and domesticating them was already at hand, although a long time was yet to intervene before this was definitely accomplished.

As would be expected of a race long accustomed to the chase, the art of fishing was also developed, and, although still without boats, the man of Solutré became an efficient shore fisherman. The Solutréan fishhook was a straight piece of bone, pointed at both ends, and tied to a thong about the middle. The bait was evidently put on both ends, and the whole swallowed by the fish. Upon pulling on this implement it would become placed transversely across the pharynx or stomach of the victim, and the fish would then be easily pulled in.

The Solutréan Period was established upon a cave deposit located near the village of Solutré (Saone-et-Loire), France, a deposit that showed at once by the nature of its artifacts a different type of culture from any hitherto known. A characteristic form, occurring in abundance, is the "laurel-leaf point." This consists of a thin, flat blade of lanceolate outline, pointed at both ends, and with a finely retouched edge running around the entire margin. This flint was evidently intended to be inserted in the end of a stick, sinking in deeper with every blow,

Fig. 36. — Implements from the Solrian Period. (1), (3), and (16) are the typical "laurel-leaf" lance heads or knives. (15) is a fish-hook. (7-10) suggest the development of the barb: at first a broken-off corner, placed low down on the implement, then made integrally. (11) is of bone, but faithfully imitates those of stone. (6, and 7) are borers. (After Forrer.)



but prevented from splitting its haft by being tied with thongs. The finished weapon was probably a javelin.

Among these points, too, there occurs for the first time the barb, placed on one side only, and exhibiting a complete series of stages, from the simple triangular point with one of the lower corners broken off, to a deep notch, placed much higher up along the side. Since a similar point, barbed on one side only, and hafted as a knife, is found among the modern Eskimo, who show in many other respects a Solutréan level of culture, it is quite probable that here also the tool served a similar use, and that there, as here, the barb was developed as a means for fastening the piece more firmly to the handle. The later development of the double barb in a missile point, with the hostile intention of retaining the weapon in the wound, was thus plainly accidental in origin, and traceable to peaceful and industrial causes.

40. *Middle Paleothic Times; the Magdalenian Period.*—As the men of the Solutréan Period are called the "wild horse hunters," the Magdalenians are frequently called the "reindeer people," for the southern migrations of these animals, begun in the Solutréan, continued throughout the succeeding period, and the contemporary human culture is closely associated with this animal. Its flesh served as food; its bones and horns supplied the materials for numerous implements; its figure was etched upon the walls of the caverns or carved upon ivory poniard handles; and its skins served for clothing, fastened together by horn or ivory studs, or sewn by rude bone needles or bodkins.

This great advance in culture development, which shows us a people at about the level of our present day

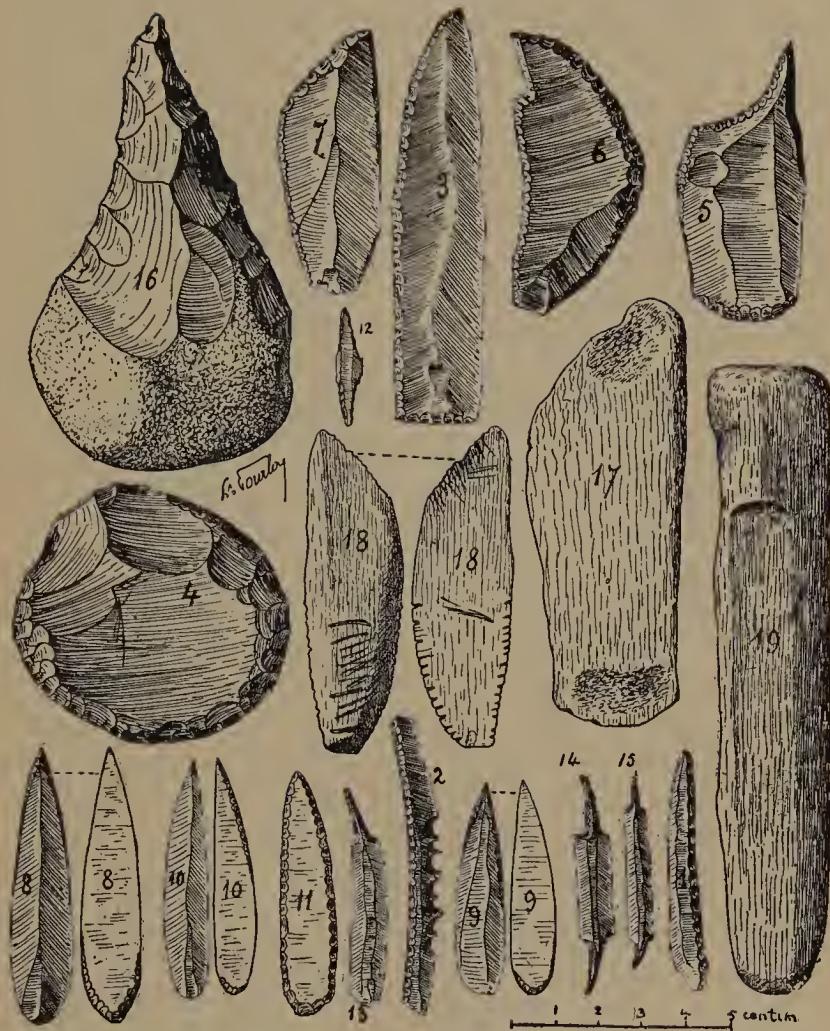


Fig. 37.—Flints of the Magdalenian Period, from the cavern of Laugerie-Basse (Dordogne). Note especially the row of little tools of various shapes, indicating a well differentiated technique, and trained fingers. One half natural size. (After Bourlon, in *L'Anthropologie*.)

Eskimo, is made comprehensible through the study of the Aurignacian and Solutréan, which, in all lines, show the beginnings of those arts that came to fruition in the Magdalenian.

From this time on, in the study of human development, it is no longer possible to enumerate at length the various types of implements used, for there has been a great multiplication, both in the shapes and sizes, and in the materials; and bone, horn and ivory have been successsively added to the flints. Each of these materials, however, presents different possibilities of manufacture, and its introduction is succeeded immediately by new types of implements, rendering possible new industries as well as great improvements of the old. Thus the pursuits of hunting and fishing, which had already in the previous period received much attention, and which, as now, were undoubtedly prosecuted by the male portion of the community, profited greatly from the development of delicate lances and barbed spears, which the use of bone and horn made easily possible. The spear-thrower also, the precursor of the bow, made its definite appearance, and the elaborate ornamentation to which it was subjected, especially the frequent appearance of a human face at the handle end, suggests not only the great value

² W. J. Sollas, in his "Ancient Hunters" (Macmillan, 1911) compares the Mousterians with the Australians in culture, the Aurignacians with the Bushmen, and the Magdelenians with the Eskimo. The extinct Tasmanians may have been Chellean. In many ways these comparisons are striking, and the remains of these modern peoples, if found in deposits many thousands of years from now, would correspond quite closely with those of the prehistoric peoples specified. One must remember, however, that, while the Aurignacians and Magdalenians were men of our own species, the Mousterians were Neandertals distinct specifically from *Homo sapiens*.

with which it was regarded, but also, after the analogy of many modern peoples, that it was viewed almost as a sentient being, cared for and probably given a definite name, as in the sword "Excalibur" of the Arthurian

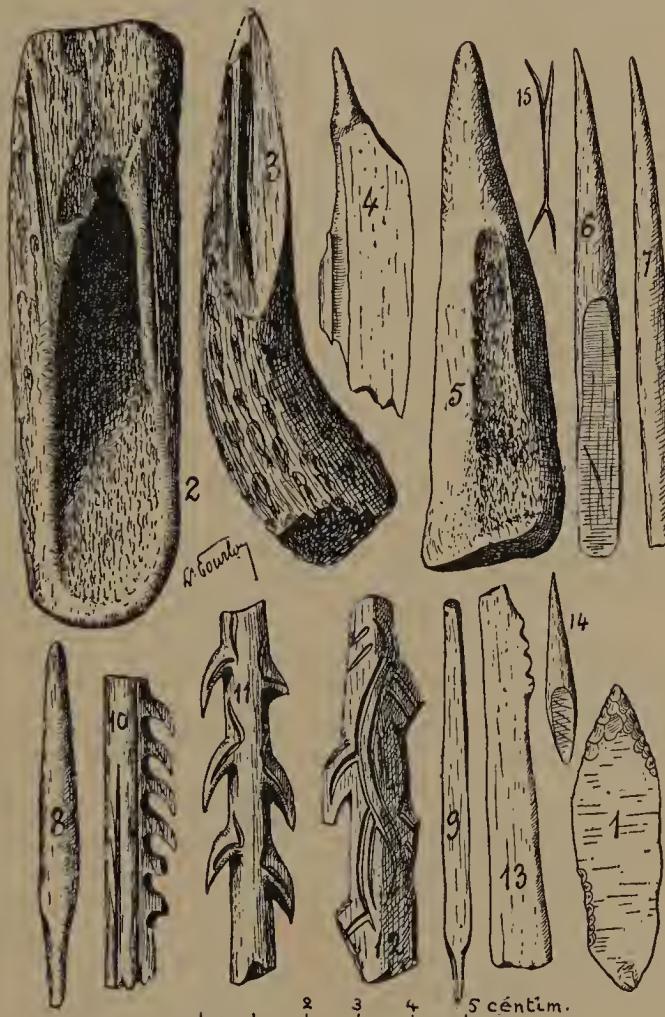


Fig. 38.—Implements of bone and horn of the Magdalenian Period, from the cavern of Laugerie-Basse (Dordogne). One-half natural size. (After Bourlon, in *L'Anthropologie*.)

legends. Similar spear-throwers, for the mechanical propulsion of missile weapons, and substituting a stronger force than that produced by the unaided arm muscles, although usually formed of wood instead of horn, are found to-day in many parts of the world; for example, among the Australians, and the Indians of British Columbia. This weapon is used, not as a missile itself, as in the case of the boomerang, but as an engine for the projection of a javelin, or arrow. The blunt end of the proper missile is received into a notch of the throwing-stick, and is launched forth by a rapid movement of the stick in the hand, much as in the case of the springy stick used by the modern small boy in hurling green apples or balls of clay. That in this engine, which employs the elastic character of the material as an aid in hurling a dart, the possibilities of the bow are already suggested, is evident to all.¹

¹ While there is to us a definite connection between the spear-thrower, a mechanical device for the propulsion of a javelin, and the bow and arrow, there is no indication that the latter evolved from the former. The javelin, first hurled by the hand, surely developed into the arrow, but the spear-thrower never developed into the bow. There are several causes which obscure our knowledge concerning the time or manner of introduction of this latter weapon. In the first place a spear-thrower, or throwing-stick, was made of ivory, horn, or some such rigid material likely to be preserved, while, in order to insure the proper degree of elasticity, a bow must be of wood, a material scarcely to be looked for in deposits of such remote antiquity. The first definite record of bows comes to us from certain of the rock paintings of the Pyrenean region, but an exact date of these in terms of the established periods of prehistory presents serious difficulties, and is uncertain at best. It has often been taken for granted that all the rock paintings in this region, together with the ivory statuettes, belong to the Magdalenian Period, but if this be so, says Breuil, the men living in Spain at that time were in some points very different from their French contemporaries, the typical Magdalenians. It is much

The woman's part in this cultural development is revealed by the numerous bone awls and needles, which suggest the possibility of shaped garments of skin, to be employed during the winter months as a protection from the cold. Personal adornment, undoubtedly employed by both sexes, sometimes found in earlier periods, has now become a pronounced feature, and pendant ornaments, necklaces, and so forth, of shell, bone and teeth, bored to allow them to be strung, are frequently met with. The danger with which the hunting of the cave-bear was still fraught, and the honor accruing to the slayer, are eloquently told by the occurrence of teeth of these animals, especially the canines, pierced by round holes for attachment to thongs.

Associated mainly with the Magdalenian Period is the remarkable development of art, expressed in all possible ways, which renders this epoch the Golden Age of the Paleolithic. Within the deposits on the floor of caves and rock shelters are found admirable sketches of contemporaneous animals, cut into the surface of pieces of bone, ivory and stone; and more rarely there occur excellent figures in the round, sometimes by themselves, sometimes serving as the handles of poniards and other implements. In these small figures, with the complete animal only three or four inches in length, the technique reaches its highest point of perfection, since they are executed in detail, and often show great skill in adapt-

more probable that the Pyrenean paintings in which the bow and arrow appear are, though ancient, much later than the Magdalenian, and belong to the Azylian Period, or even later. Such a supposition has the advantage of being in close accord with the independent conclusions of archeologists in other countries, *e.g.* the Danes.

ing an animal form to use as a handle, being at once natural in pose and easy to grasp. Thus in a well known poniard of ivory, the handle is a reindeer, with forelegs in a kneeling position and with the head thrown back. The antlers thus rest naturally along the back, the forelegs are practically disposed of, and the hind legs are



Fig. 39.—Sketch of a bison inscribed upon a small, flat slab of limestone. In the original the length of the body, from nose to rump, is two and three quarters inches, and the height, from forefoot to hump, two inches. Note the marks at the left, below the chest, which may possibly be the signature of the artist! From the Magdalenian deposit in the cavern of Laugerie-Basse. (After Bourlon, in *L'Anthropologie*.)

indefinite and continuous with the blade. This handle fits the hand most readily, and places the blade in exactly the proper direction for execution.

In certain localities, especially in the Pyrenean region in both France and Spain, the walls of the caverns, wherever a flat surface offers itself, are adorned with large



Fig. 40.—Wall painting, representing a charging bison. Cavern of Altamira, Northern Spain. (After Cartailhac and Breuil, in *L'Anthropologie*.)



Fig. 41.—Incised drawing on the wall of the cavern of Marsoulas, Haute Garonne, France. Probably Magdalenian. (After Cartailhac and Breuil, in *L'Anthropologie*.)

wall paintings, the outline incised after the manner of the smaller sketches, and the surface colored with chalk, ochre, charcoal and various other mineral pigments, which, in the undisturbed seclusion of the caves, have remained to the present day. Indeed, in an inner recess of the cavern of Tue d'Audobert (Ariège) there were discovered in 1921 by Count Begouen, a pair of bisons, nearly half life size, modeled in clay, as perfect as when left by the artist. They recline at an angle against a rock protruding from the cavern floor, and are in the form of a very high relief, and not quite complete statues, for the side in contact with the rock was not completed. They are about two feet each in length by one in height, and were finished in great detail, grooves and indented lines representing the manes and flowing hair, and evidently executed by an instrument of bone or wood. They were found in an inner recess of the cave, access to the chamber having been closed by a large rock, and to this circumstance they owe their long preservation. Somewhat corresponding to these statues a number of reliefs of animals, mainly horses, have been found in the open, associated with rock shelters, and nearly life size.

The artistic merit of all of these representations, whether painting or sculpture, large or small, is surprising. The boldness of the lines, and the exactness with which they express an idea, are often admirable, even viewed from our modern standpoint. They are so excellent and so numerous that we possess complete sets of illustrations of at least the larger fauna of the epoch, which would reproduce the conditions for us, even though there were no bones available, with which to corroborate

the work of the Paleolithic artist. In these representations we find with great frequency the bison, the reindeer, and the mammoth, the latter incised or carved in the round upon a piece of its own ivory. More rarely are found bears, both the huge one of the eave, and the smaller brown variety, with the specific characters well marked; also the ur, the horse and the wild pig.¹

Representations of man himself are of rare occurrence, and then never so well done as are the associated animals. The faces are often grotesque, and the females are usually shown grossly fat, of the type admired by the present-day Bushmen. The human figures are generally nude, perhaps always so, but in a few cases certain regular lines, which cover the bodies, and which cannot be interpreted as shading, represent either hair, clothes or, more likely, tattooing. In incised sketches man often appears

¹ As the best of this Paleolithic art has been found in France and northern Spain, the first record of new discoveries in this line appears in the French technical journals, especially in *L'Anthropologie*. Among these may be mentioned the following: *L'Anthropol.*, T. 15, 1904, pp. 129-176; article by E. Piette on the finds in the cavern of Mas d'Azil (Dept. Arriège), T. 15, 1904, pp. 625-644; Cartailhac and Abbé Breuil on the mural paintings in the cavern of Altamira (Prov. of Santander), Spain, T. 18, 1907, pp. 10-36; article by the above authors on the deposits of the grotto of Laugerie-Basse (Dept. Dordogne), T. 19, 1908, pp. 15-46, article by the above authors on the cave of Niaux (Arriège), T. 23, 1912, pp. 529-562; article by the Abbé Breuil and others on certain caverns of Spain, la Vieja, and Echelles, T. 27, 1916, pp. 1-26; article by the late Capt. Bourlon on the newest finds at Laugerie-Basse. Illustrations and description of large rock sculptures are found in *L'Anthropol.*, T. 22, 1911, pp. 385-402, by Lalanne and Breuil, describing those found at Cap-blanc (Dordogne). The bisons modeled in clay are described by Count Begouen in the same journal, T. 23, 1912, pp. 657-665. An excellent popular article, mainly on the mural paintings at Altamira, in Spain, appeared in the *Illustrated London News*, Aug. 10, 1912.

as a hunter. In one such he is seen, crawling upon his stomach, with uplifted javelin, stalking a grazing bison, which appears already alert, as though scenting danger; in another an unclothed man walks along, carrying a stick or spear over his shoulder.¹

It is naturally difficult to date a mural painting found upon the wall of a cave, and we are none too sure concerning many of the smaller works of art found in deposits that contain both Aurignacian and Magdalenian artifacts, especially as many forms characteristic of the earlier period were still in vogue during the later one. There is consequently some difference of opinion concerning the time during which this art was at its height.

There is a well supported view which places much of the art within the Aurignacian Period, and Sollas draws a telling comparison between the Aurignacians and the modern Bushmen, by putting the statuettes of grossly fat women in the Aurignacian Period, and comparing them with the steatopygous females admired by the Bushmen. This date for the statuettes referred to is supported in his recent work ("Men of the Old Stone Age," 1916) by Osborn, who includes here most of the cruder carvings and paintings and a few of those with more merit. Others, including Déchelette, consider the Magdalenian

¹ Many of these rather poorly executed human figures are attributed by many authorities to a previous period, the Aurignacian, which relieves Magdalenian art of the burden of responsibility for them. Several incised figures of two feet or more in length have been recently found by Lalanne in the shelter of Laussel (Dordogne) of which good representations will be found in *L'Anthropologie*, T. 23, 1912, pp. 129-149. One of these figures is that of a well-proportioned man, seen from the side; two others are those of grossly fat women, one holding the horn of a bison in her uplifted right hand. The author considers these definitely Aurignacian.

as the period which witnessed the greater part of the development of Paleolithic art, but this latter author places the last and best pieces in the Azilian, the period immediately following the Magdalenian. As somewhat opposed to the first view, so long as it is still a theory, is the practical absence of artistic power during the Solutréan, that intervenes between the Aurignacian and Magdalenian; also, the crudeness of the Aurignacian manipulation of bone artifacts used for other purposes.

The development of art is definitely associated with life in caverns, and points to a time of cool climate, and the plentiful use of fire. It is known also that, aside from the firelight, the Paleolithic artists employed a simple type of lamp. These, in the form of flat, oval pieces of stone, bearing a hollow perhaps for the reception of animal fat or oil, have been found on the floor of caves, in association with the mural paintings: yet, although in modern art and in imaginative literature the early cave artists are commonly represented as working upon, or admiring, their work in the deeper recesses, lamps in hand, there are so few of them found, and the original purpose of these oval discs is still so uncertain that, as an expert archeologist (N. S. Nelson) has stated, in writing to the present author concerning this very point, "the means of lighting used in exploring or while drawing pictures, in distant interiors of the caverns, seems still an unsolved problem."

41. *Late Paleolithic Times; the Azilian-Tardenoisian Period.*¹—The great geological event which put an end

¹ Sollas, who includes the Mesvinian and Strepian in the Paleolithic, closes this age with the Magdalenian; Dechelette closes the Paleolithic at the same place and uses the Azilian as

to the Magdalenian Period and ushered in the periods collectively termed the Late Paleolithic was the final diminution of the cold, and the melting of the great glaciers. This event brought important changes throughout central and northern Europe, and profoundly affected all animal and plant life there, including man himself. The melting of the vast ice fields filled the lower lands with chains of great lakes, which roughly defined the modern river valleys; and this condition produced in its turn an unusually heavy rainfall, that developed in those lands that lay above the lake level a plentiful system of rivers. These were precisely the right conditions to produce a luxuriant forest growth, and the face of the country, which had previously exhibited vast steppes or prairies, inhabited by herds of reindeer, bison, wild oxen and horses, became utterly changed. The reindeer, both because of the milder climate, which they could not endure, and the destruction of the plains upon which they depended, disappeared entirely, perhaps following the glaciaries in their northern retreat, and their place became taken by deer, which found in the forest a congenial environment, and which the final extinction of the cave bears, mostly by the hand of man, allowed to multiply almost beyond limit. The mammoth, another steppe animal, probably wandered eastward and northward, finally to die out utterly, almost within historic times, in his last strongholds in northern Siberia; but the wild horse, the bison, and the great European wild ox,

a period of transition to the Neolithic. Osborn sees in the Azilian-Tardenoisian a "revolution," where all Paleolithic history comes to an abrupt end, and where the entrance of several new races prepares the way for the Neolithic Age.

the "Ur" of the German traditions (Julius Caesar's "*Urus*"), although undoubtedly reduced in numbers, were still to survive.¹

To the prehistorian one of the most striking results

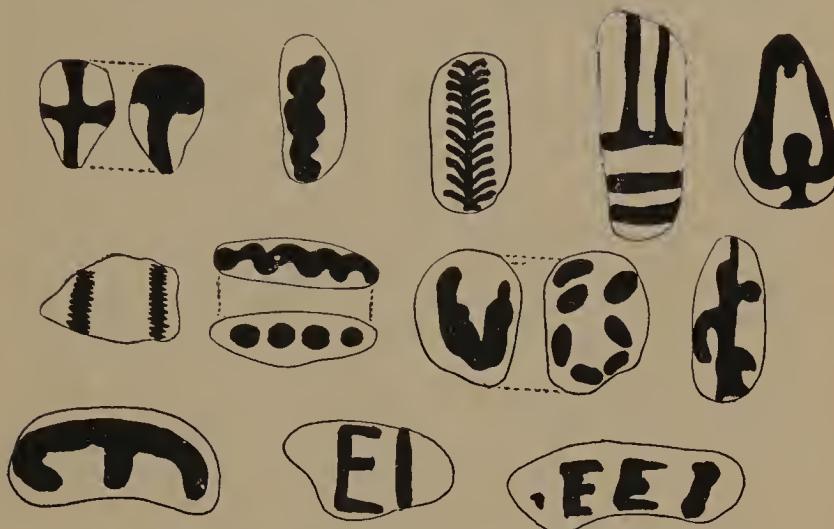


Fig. 42.—Pebbles painted with alphabeticform characters. The two sides of the same pebbles are shown in three of the cases, connected by dotted lines. These are samples of the "galets colorées" of M. Piette, and occur in considerable numbers in the Tourassian (Azylian) deposit of Mas d'Azyl, the first of the post glacial deposits. The use of these pebbles is unknown. (After Piette.)

¹ The horse, although no longer in a wild state, readily becomes practically so when allowed to run for a time unherded and unconfined, as in the great plains of Hungary, and in the western United States; the European bison, *Bison europaeus*, exists now in the form of a few protected herds, much as in the case of its American cousin, *Bison americanus*; but the great ox, *Bos primigenius*, mentioned in the Nibelungenlied, and furnishing both name and coat of arms to the canton of Uri, Switzerland, has become extinct. It was common in the Black Forest at the time of Julius Caesar, and survived in Poland until about the year 1600. Crossed with the domestic species, *Bos taurus*, it has, however, contributed its blood to certain breeds, notably the black and white "Holstein," upon which it has bestowed its large size. The great gray oxen of southeastern Austria also may very likely have a *Urus* strain.

of this change is seen in the sudden cessation of artistic power, which in fact, never appears again in the same form. The few drawings definitely ascribed to this period are childish in their execution and not for a moment to be compared to those of the Magdalenian. On the other hand, although it would seem but a poor compensation for the loss of artistic power, there developed an industry or pastime, the meaning of which is far from clear.

In certain of the deposits of this period, notable in the grotto of Mas d'Azil in southern France (Ariège) occur numerous small pebbles of rounded shape, painted with bands and stripes in a way almost to suggest some form of lettering.¹ This appearance is probably accidental and the pebbles may have been used in playing some sort of game, or in magic, pursuits to which primitive people are always prone, and which occupy an important place in their daily life. A similar type of object consists of small flat pieces of bone of various shapes, incised with all sorts of geometric designs, and

¹ Cf. the writings of M. Piette, especially in *L'Anthropologie*, T. 14, 1903, pp. 641-653, in which he shows close similarities between the designs upon the Mas d'Azil pebbles and the primitive Phoenician and Greek alphabets. This article is, however, immediately followed by another, by Arthur Barnard Cook, denying the alphabetiform character of the pebbles, but comparing them to the *churinga*, or "bull-roarers," of the Australians, which are small pieces of wood attached to long strings. By whirling these around, strange sounds are produced which the Australians believe to be the voices of their dead. Perhaps a more likely comparison is that of Solomon Reinach (*L'Anthropol.* T. 20, 909, pp. 604-605) who cites a custom of the now extinct Tasmanians. These people used little stone plates "marked in various directions with red and black lines" to represent their absent (or deceased?) friends. Aside from the collection of Piette, which contains more than two hundred of these "painted pebbles," there are but a few known.

often pierced each with a small hole, by which they may have been strung on strings.

Indicative of a more serious purpose are numerous harpoons, lance-heads, awls and needles, of stag-horn, which suggest the association with the herds of deer now filling the forest, and give to this folk the appellation of the "Stag-people," sometimes used.

This period was founded originally by de Mortillet upon remains found in the cave of La Tourasse, near St. Martory (Haute Garonne), France, from which the period was called the *Tourassian*, but as the contemporary deposits of Mas d'Azil have become more famous, and are of much greater interest, the alternative name of Azilian is now more usually employed.¹ Apparently man still inhabited caves during the early part of the period, but soon abandoned them for the forest and open plains, where he probably erected some form of artificial shelter. Such a form of life is not favorable for the preservation of records, especially as the distinctive artifacts were made of bone and horn, materials which would not be preserved unless in cave deposits, or similar places. The period has thus left behind few definite records, and one gets the impression, which may or may not be true, that there was at this epoch a marked diminution in the human population of Europe.

It is probably in this period, the Azilian, or in those

¹ The deposits at Mas d'Azil, which have yielded very many valuable objects, has been exploited by a single man, Edouard Piette, who has published a large number of short papers on his finds. These are scattered through various periodicals, mainly in *L'Anthropologie*. His great work, "L'Art pendant l'Age du Renne," an album of 100 plates, appeared in 1907 (Paris).

immediately following, the Flenusian and Tardenoisian, that a certain type of cave paintings belongs, which occurs in the same regions as those of the Magdalenian, but is strikingly unlike the latter in every detail. Compared with the Magdalenian mural paintings these, although much later, are extremely crude, and differ so much from them in general style that they can easily be distinguished at a glance.

In these paintings there is always a perfect bewilderment of detail, although there is evidently an attempt to group all the figures that occur together into a single picture. The animals, in which the stag and the ox largely predominate, are done mostly in silhouette, and are conspicuous from the slenderness of their parts, especially the limbs. The same is also true of the human figures, which, unlike the paintings of earlier ages, are everywhere met with, usually in the act of shooting at the various beasts with actual bows and arrows. Both animals and men are shown of very different sizes, possibly with the idea of representing perspective. The men are nude, sometimes with long flowing hair or some sort of headdress. In the few cases in which women are shown, they wear what is unmistakably a long skirt, although the material, whether of skins or cloth, is not clearly indicated. Thus nothing can be postulated concerning the knowledge of weaving.

Naturally, as in all cave paintings, those of this type are difficult to date. That they are very old is certain from several reasons, especially the fact that the floor deposits often cover up the lower parts of the pictures; yet several important points about the delineations themselves show that they are post-Magdalenian. The ani-



mals depicted are exclusively those of the more modern times, and fitted to a more modern climate; human figures are constantly met with, and are commonly depicted in the act of discharging arrows by means of genuine bows. The style of drawing, also, is vastly cruder than the art which flourished during the Magdalenian Age, and is totally unlike it. Sollas has shown, and most convincingly, too, the close similarity between these and the rock painting of the modern Bushmen of South Africa, and, assuming the date of the paintings to be Aurignacian, has drawn many parallels between these two peoples. This final conclusion of his cannot hold if the paintings are not Aurignacian, but the observation of the similarity of these to the Bushman art is extremely apt, and points definitely to the presence in Europe of people of an almost identical grade of culture. Their date is rather uncertain, but it will not be far wrong to place it at about the Azilian-Tardenoisian, just previous to the typical Neolithic.

42. *Late Paleolithic Times; the Kitchen-Middens.*—The men of this and the succeeding periods did not, however, live exclusively in the forests, or in the interior of the open country, but frequently encamped upon the sea-coasts, or along the shores of the extensive lakes which covered so much of the land area, where they subsisted largely upon the various species of shellfish which were there procurable. As a by-product of this form of life there accumulated in such places enormous masses of shells, the almost indestructible residue from their feasts, which in some places form to-day deposits of many feet in thickness, extending over large areas. Interspersed among the shells are found occasional bones and

teeth of the animals eaten, and more rarely instruments of all sorts, either broken and thrown among the refuse, or accidentally dropped. Such refuse heaps form for the prehistorian extremely valuable documents, from which the mode of life of the people who left them can be readily ascertained. Owing to the different character of fresh and salt-water molluscs, the refuse heaps left about the lakes are inconsiderable in bulk or importance, but those deposits along the sea coasts, composed of such bulky shells as those of oysters or clams, are often extensive, and actually aid in the formation of promontories, small headlands, and islands.

Heaps like these occur in all parts of the world, but in many places, as along the Atlantic coast of the United States, they may be attributed to peoples still living, in this latter case the Indians; in Europe these formations are prehistoric. The best known and most extensive of these are found along the coasts of the Baltic Sea, where the earliest heaps (Maglemoes) are about contemporary with the Stag-people (Azilian) and extend from that time through a part of the Neolithic.¹ Immediately after

¹ "There is a peculiar difficulty connected with the classification of the kitchen-middens as 'late Palcolithic.' Historically there is some ground for doing so, but technologically and typologically there is little justification. The method of shaping rock by pecking and rubbing goes back as far as the Aurignacian; while, on the other hand, flint flaking and chipping continues to the present day in Europe. On technological grounds, therefore, we ought to date the eolithie from the Aurignacian, which no one has ever proposed.

"Typologically, the problem is considered simplified. Beginning with the Magdalenian, there was a distinct advance in the bone-working industry and a correspondingly marked decline in the flint industry. In Azilian-Tardenoisian times the flint industry gives the impression of almost complete degeneration. There was an effort about this time, or directly following it, to make even chisels and axes out of bone and antler. But

the final melting of the Wurm Ice the present Baltic Sea was a landlocked lake, presumably the largest in Europe, and filled with fresh water. This is shown by the abundance of shells of fresh water molluscs (*Ancylus*) laid down during this time. At last the North Sea broke through the land in many places (Great and Little Belt, Öre Sund) and, as the water of the ocean gained entrance, the oyster and other marine molluscs replaced those of the fresh water. The Baltic thus became one of the great sources of food to the northern Europeans, and eventually, as shown by these refuse heaps, became entirely surrounded by human settlements. The Danish prehistorians of the last century, whose attention was early attracted by these mounds, called them "*Kjökkens-möddinger*," or "*kitchen-middens*," and this name has been accepted as the technical term for such formations everywhere.

These northern shell heaps, beginning to be deposited during the Azilian Period, and continuing for many centuries, represent for the most part that long transition period, previous to the definite Neolithic, during which man slowly acquired the arts used as criteria of this latter age. The most important of these are: (1) smooth stone implements, (2) pottery, (3) weaving, (4) agriculture, and (5) the domestication of animals. These were all acquired during the interval succeeding the

obviously there was no real opening in that direction and so in the Campignian culture, to which horizon the shell mounds clearly belong, we find the implement maker on a new tack. In France and Denmark at least, appear rudely flaked types of both chisels and axes, the true forerunners of the polished type characteristic of the Dolmen and Passage-grave periods. On that ground I should say that the Neolithic, in its broadest, truest sense, began with the shell mounds."—N. S. Nelson.

Azilian, often conveniently designated the *Transneolithic Period*, and the clues to these achievements, the explanation of the initial experiments leading up to these vast results, are found for the most part in the Scandinavian kitchen-middens.

Although numerous objects from these deposits are scattered over the world, in museums and collections, the greater part of them are stored in the National Museum at Copenhagen, whither the scholar must betake himself for the best documents of this transition period.¹

43. *The Transition to the Neolithic.*—Technically, as embodied in the name, the criterion between the old and the new stone ages (Paleolithic and Neolithic) lies in the art, possessed by the latter, of finishing the entire surface of a stone implement so that it is *uniformly of a smooth, or "polished" character, without a trace of the original flaking by means of which it was at first shaped.*

It is also to be emphasized that by no means *all* of the stone implements of this age were smooth and polished,

¹ Based upon contemporary deposits in other parts of Europe, different prehistorians have sought to divide up the Transneolithic into a number of distinct periods, naming them, after the usual manner, from the geographical locality where characteristic deposits occur. Thus, immediately following the Azilian (Tourassian), come in order the *Fleensisian* (from *Fleenu*, in Belgium, with its neighboring site *Spiennes*), the *Tardenoisian* (from *Tardenois*, *Aisne*, France) and the *Campignian* (from *Campigny*, *Seine-inferieure*, France). In strict definition, the *Neo-lithic Age* is characterized by the smoothed or polished stone artifacts that occur among its deposits, but this character, although the one selected for obvious comparison with previous times, is in reality much less noticeable and characteristic of the period than a number of other newly introduced advances. Besides the introduction of polished stone, the Neolithic Age witnesses the first appearance of *pottery*, of *basketry* and *weaving*, of the *domestication of animals*, and of *agriculture*, together with the numerous subordinate arts and industries associated therewith.

but that the rougher types of stone artifacts continued to be used for certain purposes. For such temporary purposes as arrow-heads, for example, a paleolithic surface was good enough, and the efforts of the artificer were

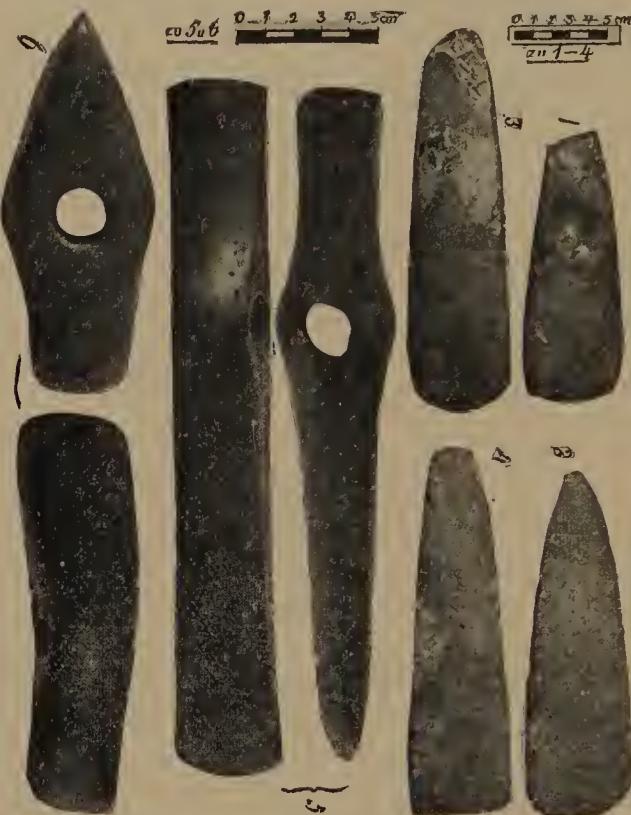


Fig. 44.—Typical Neolithic axes from Longeville, now in the museum at Metz. The socket axes and the triangular ones, tapering to a point at one end, are late Neolithic; the square ones are earlier. (After Schumacher, in *Prähistorische Zeitschrift*.)

expended upon the essentials, such as the sharpening of the point and the two lateral edges, and in improving the general proportions.

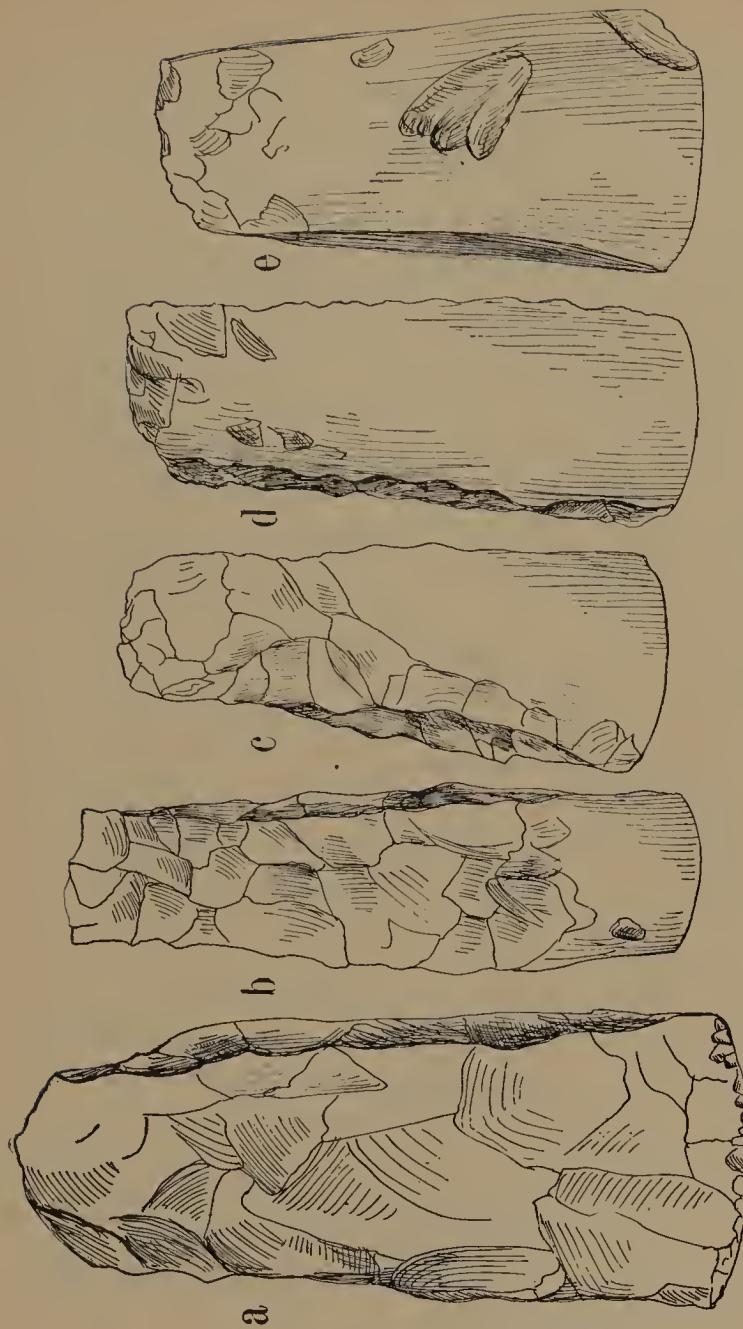


Fig. 45.—Five axes from the Danish kitchen-middens of the transition period, showing as many steps in the conversion of a paleolith into a neolith. (Drawn from specimens in the Smith College Collection.) In (a) the edge is improved by retouching, but with no suggestion of polishing. The others show different degrees of polishing—i.e., smoothing.

It was thus only the best and most permanent implements, like axes and chisels, that received the surface finish, and this art was learned, as the kitchen-middens teach, quite by accident, and presumably in a very short time.

The whole process is well illustrated by the accompanying figure (Fig. 45), representing a series of axes from the kitchen-middens of Denmark. In these it is at once seen that the process was inaugurated *by a new method of sharpening the blade, that is, by a long rubbing against another stone, first upon one side, and then upon the other.* This process, having at first as its sole object the improvement of the cutting edge (Fig. 45 b), became continued further up the sides, probably at first to allow the instrument to slip better along the incision made (Fig. 45 c). When, finally, the most bulging portion of the curve was passed, and it was no longer necessary for the efficiency of the instrument to continue the process of smoothing, the portion remaining was so small, and the smooth surface gave so much better an appearance, that the surface polishing was completed for esthetic reasons, and the *paleolith* became a typical *neolith* (Fig. 45 d, e).

A second important advance shown by Neolithic people is the art of making pottery; and as "shards," or fragments, of these are practically imperishable, and as such shards are naturally rather abundant about the sites of human activity, their value in estimating the age and period of culture of a given deposit is very great. They have been well termed the "*Leitfossilien*," or guide-fossils, of Neolithic deposits, and their presence in an undisturbed culture layer must be taken as an undoubted

proof that the layer in question is Neolithic, or later. Especially, indeed, as we come to post-Neolithic times, shards become of increasing importance, since, from the Bronze Age on to classic times, the potter's art becomes continually more differentiated. There thus develops not only a multiplicity of form and size, subserving a greater variety of uses, but a great advance in the method of decoration and of finishing the surface, resulting eventually in almost countless types of pots and other clay utensils, the remains of which date a deposit with almost the exactness of a coin.

According to the ideas of some prehistorians, the Neolithic culture was introduced by an alien people, presumably Asiatics, who brought with them the art of pottery, together with a knowledge of agriculture and certain domestic animals, like the sheep and goat; but, as in the case of the smoothing of the stone implements, above cited, there is plenty of evidence to show that certain of the arts characteristic of the Neolithic Age were gradual and local in their development; that is, that they were acquired, in their simplest form, during the periods immediately preceding the definite Neolithic.

The first suggestions of modeling objects out of clay naturally and spontaneously occur as the result of constant association with that substance; and as this material is everywhere present, its plastic nature and its readiness to receive impressions are, for primitive people, matters of continual observation. The deposit on the floor of caverns is usually of a clayey nature; clay, too, is often associated with the smaller water pools, or with certain parts of the banks of rivers and ponds, which

are the especial places sought by early man for his habitations.

It must always be remembered, not only that in general primitive man comes far more closely into contact with the phenomena of external nature than we do, but that the quality of the soil walked upon is a matter of much moment to an unshod man. He perceives the least differences in the surface, and constantly feels the ground with his naked feet. The firmness of turf, the shifting character of sand, the slippery nature of clay are thus perceived and differentiated to an extent impossible to realize by one who, equipped with shoes, walks with comparative indifference over all sorts of footing. It is thus inevitable that the properties of clay were well known to early man, and that when first he attempted to intertwine twigs and branches to form a rude shelter, he would naturally fill the interstices with clay to make the structure watertight at the time of the heavy rain.

But in this type of hut-building, one hardly beyond the constructive intelligence of the chimpanzee, are found the beginning of the two twin industries, basketry and pottery, for the basket is but a specialization of the twig-woven shelter, and becomes converted into a watertight receptacle by being lined with clay. If such a utensil is left accidentally in too close association with the hearth the fire causes the clay to become hard, and burns away the basket at the same time, yet leaves in place of the mutilated implement one of a new sort that is much better for the original purpose than was the first one before the accident. When once thoroughly fired, the vessel can be suspended over the hearth, or may even be put directly upon the coals, thus for the first time introduc-

ing the new technique in cooking, in which the fire is placed beneath the pot in which the cooking is taking place, and by doing away with the clumsy, but time-honored method of boiling by means of hot stones placed in the pot with the food.

From the various stages of the pot-making industry found in the New World, whose inhabitants at the time of the discovery were within, or very near, the Neolithic type of culture, we find many corroborations of this theoretical sketch of the probable origin of ceramics. In shell mounds and other aboriginal sites there are frequently found shards, the outer surface of which shows the impress of a mat or basket. In these fossil textiles the stitch of the original cover may be easily recovered by covering the marked surface with wax or plaster, and afterward separating it from the shard. When this is done the woven textile, in positive form, appears upon the plastic material.

Quite independently of the method of developing pots from lined baskets comes the modern Indian method of building up coiled ware. In this the pot is made by coiling up in any desired form a clay rope, and then fastening adjacent coils by pinching them together at frequent intervals with thumb and finger. When these pinched places are properly and regularly spaced a pleasing effect is made, closely resembling the coiled basket, from which it was evidently derived. As this form of basket is itself a highly specialized form, any pot derived from it must also be of much later development than one originally derived from a basket lining, the basket itself being a much more primitive one.

The constant and universal employment of pottery in

Europe appears at the advent of the Neolithic, among other new industries; at the same time traces of certain very simple pots are found in the Campignian, immediately preceding the genuine Neolithic, and thus again the question confronts us, whether the art of making and using pottery really developed in place on European soil, or whether it was suddenly introduced from elsewhere.

Concerning the appearance of domesticated animals, an important Neolithic characteristic, there is the same uncertainty as in the case of pottery. In favor of the gradual development in place are the numerous indications in the kitchen-middens, which are in part transitional, and are placed just before the Neolithic, of a closer association of certain local animals, especially the dog and the pig. The dog manifests his presence here through the unmistakable marks of his teeth upon the bones left from the human meals, and occasionally there appear his own remains, together with those of two varieties of pig, the little marsh form, *sus scrofa palustris*, and, for the first time, the common domesticated form, *sus scrofa domestica*. The whole picture drawn of these early dogs is one of wandering scavengers, living in a sort of spontaneous association with man, tolerated camp followers, trooping in after the meal time, or by night, to feed upon the refuse, but not definitely owned or cared for. In much the same way the jackals of the East, and the coyotes of western America, hang about the camps, and with the slightest encouragement would doubtless become habitually associated with a human tribe or family.

Thus, step by step, during the epoch conveniently styled trans-neolithic or proto-neolithic, the cultural ad-

vances characteristic of the age of polished stone were gradually assumed. Whether this was done by a single European race, without help from outside, or whether the various new arts were gradually introduced from elsewhere, through commerce or invasion, cannot as yet be definitely known. What we are sure of, however, is that during the long period of time intervening between the last retreat of the ice, and the reduction of the great system of post-glacial lakes, while nature was moulding the land surface into its present form, and establishing the existing river valleys with their fertile meadows, man also, with added powers and increased knowledge, was preparing to inhabit the newly prepared lands. That last cave epoch was the period of final man-making. As a beast, equipped only with sticks and stones, at the mercy of the forces of nature, and driven by the resistless advance of the cold, he enters the caves for his long schooling; he emerges from these retreats a man, furnished with a great variety of well-shaped tools, fabricated of many materials, and with already the arts of the potter and, perhaps, those of the weaver also.

No longer has he to fight with gigantic and fearsome brutes for the necessities of life, but as he advances boldly out over the country, now freed for human occupancy, there follow in his train his two first animal friends, the one a companion, the other a serf—the dog and the pig. With these strange attendants he seeks two sorts of situations, the rich alluvial meadows and the shores of the mountain lakes, and there constructs for himself definite artificial shelters, in each place of a kind suited to the special environment. To these new sites he brings his new-found arts; in the peace of his environment he

further elaborates and develops them, and adds others. He learns the uses of many plants hitherto unknown, and seeks to lighten his labors by planting them near his home; he domesticates the goat and the sheep, and even casts his ambitious eyes toward the wild oxen and horses, wondering if perchance their untrained strength may not become of use to him; he finds that flax and wool furnish the possibility of making long threads which can be used in forming softer and more pliable textures. The world, now fully open, constantly adds to its gifts and increases its opportunities, and man thus passes into the light of the Neolithic.

44. *The Neolithic Age; Modes of Living.*—It has just been said that early Neolithic man selected for his habitation the two environments now offered, the alluvial plains of the river valleys and the shores of the mountain lakes. The first, with its fertile and mellow soil and its extensive areas of meadow grass, developed its inhabitants into agriculturalists and herdsmen; the second produced a race of fishermen. Along the river meadows the inhabitants established permanent farmsteads, and the retentive soil still retains the traces of their foundation posts and their simple excavations.¹ From space occupied by the dwelling itself the surface earth was removed, except in places in which it was left, or even built up in square form, to serve as seats and couches. The fires were confined to a definite hearth, with often an earthen bench or couch in front of it. The details of the superstructure cannot be exactly determined, save that the ground plan was surrounded by posts set at intervals,

¹ Cf. the previous chapter, § 15, and especially Fig. 12.

From the study of primitive architecture still extant, also, the inference is strong that these posts were connected by horizontally or obliquely placed crosspieces, bound on by sinews or by some vegetable fiber, and that a similar framework formed a low roof. Upon such a substructure a thatch of branches could be woven, and made tight by the addition of clay, or perhaps adobe, or else the frame may have been covered by coarse mats, as with the Indians of New England. In some cases the establishments were very extensive, occasionally even resembling the famous long houses of the Iroquois; and judging from the artifacts found in association with such sites—for example, spindle whorls and loom knives in one, agricultural tools in another—it is probable that the houses were sometimes apportioned according to sexes, as is common among primitive peoples everywhere. An entire settlement of this sort, consisting of a cluster of huts and houses of different sorts and employed for different uses, placed close together, was often surrounded by a ditch and palisade, as a protection from ravenous beasts and human enemies; and thus formed in itself a political unit, independent and isolated, save by occasional temporary alliances with neighboring clusters, the forerunner of the walled city (Cf. § 25).

Such farms, or compounds, consisting each of several associated buildings, were isolated from each other, and placed in the middle of extensive fields which offered grazing facilities for the flocks and herds. Here they kept, in tame or semi-tame conditions, the herbivorous animals which they succeeded in domesticating—first the goat, then the sheep, and later on the lesser ox, *Bos taurus*. The pig and dog were the more intimate associates of

their dwellings, and only the fowls and cats of the modern farm were missing. Some obscurity still lies about the origin of many of these domesticated animals, since certain of them, like the goat, the sheep, and the *taurus* species of ox seem to have originated from wild species that were Asiatic, and not European. This is one of the supports of the hypothesis that the Neolithic civilization did not develop upon the European continent, but that it was introduced rather suddenly by invasions from Asia, and that the invaders brought with them their already domesticated flocks and herds, as well as the new arts of pottery and weaving. On the other hand, the transitions in the artifacts seem to have been gradual, and the way was so well prepared for the characteristic Neolithic arts at the time they appeared, as to suggest forcibly that the changes were spontaneous and accomplished *in situ*. It is quite as easy to believe that the European inhabitants, having already achieved their initial successes in domesticating native animals, notably the pig and the dog, obtained these more serviceable Asiatic forms through a primitive commerce, the simplest and earliest of human intertribal associations; or that, perhaps, they were introduced by one or more small invasions, not of great geographical extent or ethnological importance. Whatever their origin, the important fact remains that these animals were introduced as domestic forms at the beginning of the Neolithic Age, and that they effected a complete transformation in the life of the people of Europe everywhere.

Hitherto wandering hunters, without fixed abodes, living in tents in summer and in caves in winter, the inhabitants of Europe had no possessions save those which

they could take with them at a moment's notice. Hence they had little to defend, and there was but slight inducement to attack others save in personal quarrels. But with the establishment of fixed farms, which include a large variety of specialized utensils, and form the center of extensive pastures, covered with flocks and herds, there is not only much to be defended, but a great inducement to make raids.

There thus developed defensive works along several lines, the most important of which are fortified hills, "*scharrachs*" (§ 18), and islands of firm land in the midst of swamps, "*crannogs*" (§ 17). It must have been also because of the danger of organized attack from their fellow men that there developed that other main type of Neolithic habitation, the lake dwelling, or lake village (§ 16). Naturally the method of life among the lake dwellers must in many ways have been different from that of the inhabitants of the plains; they could have a few herds, for in nearly all the spots in Europe where lake dwellings exist, precipitous mountains rise from the shore and shut the inhabitants off from grazing lands. They thus possessed neither milk, cheese, wool, nor the flesh, skins, and other valuable products furnished by flocks and herds. Their main wealth consisted of the fish which the waters of the lake brought to their very doors. But a most valuable asset consisted of their well-nigh absolute security from attack, since, with the drawbridges up, collected within their houses, and with the lake to furnish an inexhaustible supply both of food and water, an army of invaders, without boats, and with erude missile weapons, could do little or nothing. On the other hand, with a monopoly of the

fish supply, whieh they would early learn to dry and smoke and thus convert into a commercial product, they would be of great value to their agricultural neighbors, who would willingly exehange their wool, their eheeses, and their hides, for produce of the lakes. Men could no longer remain isolated, but those of different families, and from different regions, were becoming mutually dependent upon one another, banded together by commercial relations, and foreed often to defend their interests against a common foe.¹

45. *The Neolithic Age; the Art of Weaving.*—Until the dawn of the Neolithic Age the deeds performed and reorded are essentially those aehieved by men, or at least by women working in a maseuline way, the killing of huge beasts, and the fighting with other men. But from about this time appears the finer toueh of the woman's hand, traees of the manifold aetivities connected with the home, and the beginnings of the refinements and eomforts which woman has ever sought. Perhaps the first division of labor came with the establishment of the first hearth, when "the woman stayed by the fire to keep it alive while the man went to the field or the forest for game,"² and perhaps it is from this beginning, surrounded by different objeets, that the two sexes have ever become more and more differentiated. "In eontaet with the animal world, and ever taking lessons from them,

¹ For the lake-dwellings, during both the Neolithic and Bronze Ages, two excellent works are those of Ferd. Keller, "The Lake Dwellings of Switzerland, etc.,," and Robt. Munro, "The Lake Dwellings of Europe." The former is the older work, and in the English translation appeared in 1878 (Longmans, Green, and Co.); the other is more recent, 1890, and is published by Cassell and Co. London.

² Frederick Starr, in the Editor's Prefaee to Mason, *loc. cit.*

men watched the tiger, the bear, the fox, the falcon, learned their language and imitated them in ceremonial dances. But the women were instructed by the spiders, the nest-builders, the storers of food, and the

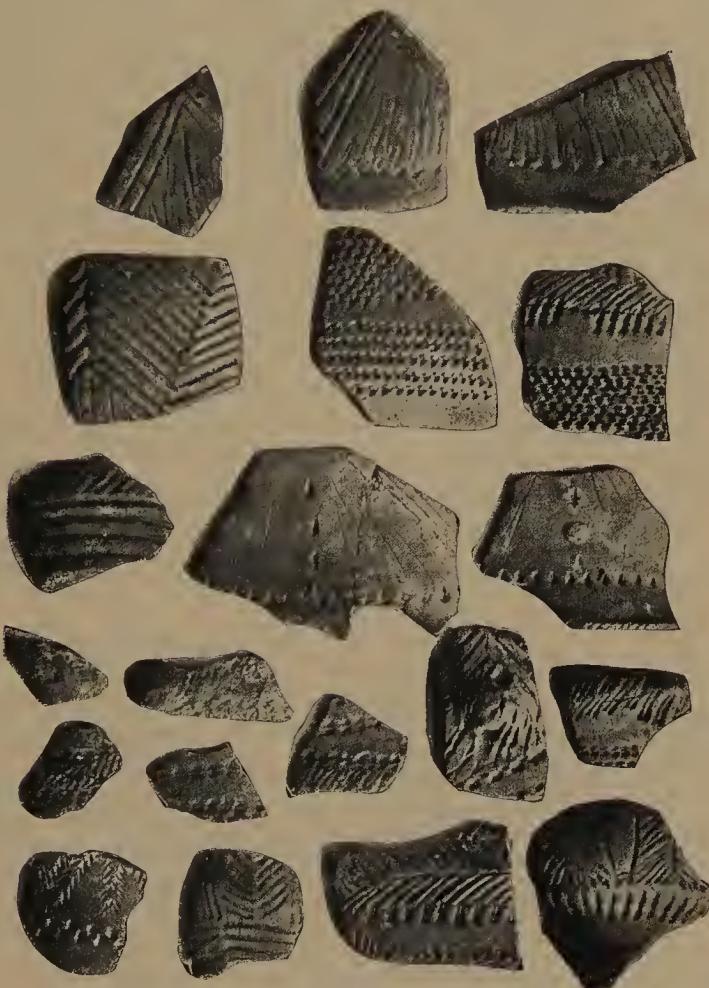


Fig. 46.—Neolithic shards from Rudigheim, Germany; typical pieces with incised ornamentation. They are strikingly similar to those found in the shell heaps and cliff-dwellings of the United States and represent a culture similar to that of our American Indians. (After Wolff, in *Praehistorische Zeitschrift*.)

workers in clay like the mud wasp and termites."¹ So that, from almost, if not quite, the beginning, while the men have cultivated the arts of war and the chase, woman has worked with equal assiduity and far more patience in cultivating the arts of peace. Not only did she learn to prepare the booty brought in from hunting, and soften the meat by means of the fire which she had learned to use, but it was she, and not her lord, who found out the virtues of the plant world, the grains hidden away in the chaff and the roots concealed in the earth, and learned, not only to find them, but to prepare them by drying, grinding, boiling, baking, and other processes. It was she who prepared garments and tent covers from the skins of beasts; it was through her patience that many of the domestic animals were tamed, and always, in the midst of all these manifold duties and employments, appeared her constant duty and highest joy, the rearing of children. And now, some time after the final retreat of the glaciers, she adds two more of her contributions, the sister arts of *weaving* and *pottery*.

Throughout the middle Paleolithic, that Golden Age of the troglodyte, man still clothed himself with skins, clumsily sewed together by the help of bone awls, and fastened along the edges by bone or ivory studs. But from the beginning of the Neolithic there appear textile fabrics of various sorts, including baskets, mattings and cloths, objects which differ from each other mainly in the materials employed. In some few favored cases, imbedded in the clay of the pile villages, or in the peat of

¹ Otis T. Mason. "Woman's Share in Primitive Culture." New York, 1899, pp. 2-3. In studying woman's part in cultural development this book is invaluable.

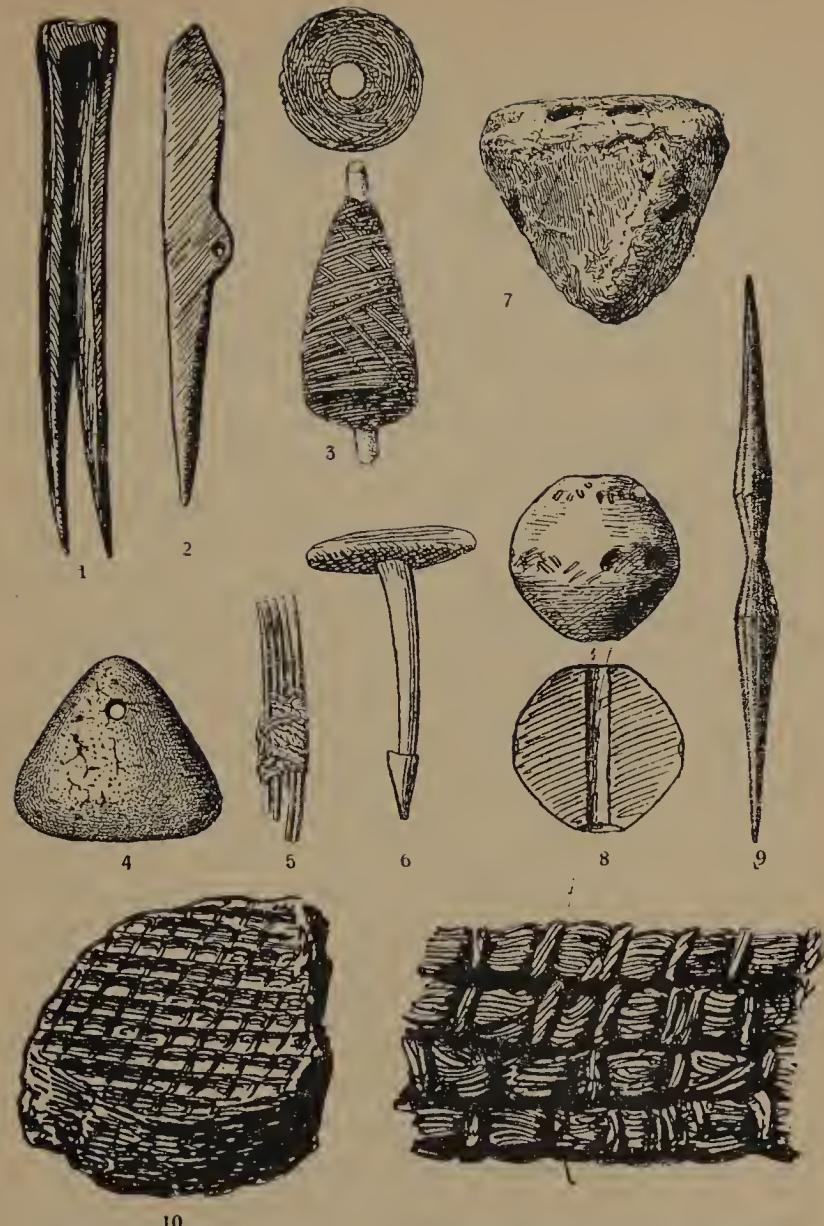


Fig. 47.—Implements and other objects associated with Neolithic textile industry, found on the site of Swiss lake dwellings. (1) and (2), bone implements for hackling flax; (3), wooden spindle with thread still on it; (4) and (7), warp stretchers of burnt clay; (5), flax hackle made of bone points, bound together with twine; (6), wooden crochet-hook; (8) spindle-whorl of baked clay; (9), bone bodkin; (10), piece of baked clay, bearing the impression of a mat of bast fiber; (10a), cast taken from the above, enlarged, showing the stitch. (After Forrer.)

the Danish moors, actual fragments of such textiles have been recovered even from Neolithic times; in numerous other cases they have made their impression upon clay, from which, by application of some plastic substance, the appearance of the original textile may be recovered; and lastly, numerous objects employed in the manufacture of textiles, like spindles, spindle whorls, and portions of looms, bear an indirect but certain testimony to the existence of the art.

By the aid, in part, of such remains, and in great part also by observing the methods of weaving still employed by primitive peoples, and studying, not merely the final products, but the character of the instruments employed in the process, the prehistorian is able clearly to sketch the gradual development of the textile art, and recover the details of the industry as practiced by the Neolithic people. Both this, and the art of pottery, in their beginnings closely associated, were in every step the achievement of women, and took their beginning in the attempt at employing flexible twigs in house construction. The chimpanzees and orang-utans of the present day construct for themselves serviceable nests, and twine above them the smaller branches, clumsily interlacing them as best they may, with thick fingers and inferior brain. But even the Paleolithic woman was far above this, and, in her twig-twining there soon grew beneath her supple fingers a definite system, by which, perhaps, one set of twigs interlocked in a fairly regular fashion with a set in the opposite direction. Such a structure once constructed, she daubs with clay to make it tighter and thus creates the precursor of both the basket and the pot. Constructed like the hut, but made small

and fastened to the back, the basket greatly facilitated her work of burden bearing, and the same receptacle, lined with clay, made a utensil capable of transporting and storing water, thus solving one of the greatest problems of early man. Developing still further along this line, the new-found art was applied to the construction of large mats, with which to clothe the ground of the hut, or throw upon the rude earthen couch; and in searching the forest for plant stems, the characteristics of the fibers of flax were discovered. In some way, too, the peculiar virtue of sheep's wool, at first left upon the hide and employed like other furs, became noticed—how that by twisting small tufts of wool between thumb and finger they become readily drawn out into threads, and this perfectly natural motion was probably often indulged in at idle moments, perhaps while lying upon couches enriched by the hides of the now domestic sheep, before the idea was seized upon and definitely applied. A fairly good yarn may be made by the fingers alone, but the twisting can be much more easily and rapidly accomplished by the use of something that can be made to rotate after the principle of a top, and thus came the spindle and the spindle whorl. The addition of a distaff, or stick to hold the unspun wool, is now all that is required to finish a spinning outfit such as is still universal in southeastern Europe, which the women employ while standing about in the fields watching the cattle and sheep, or in the intervals of rest at home.¹ The

¹In modern Greece the distaff is called *ρόζα* (Ital. *roca*, Ger. *rock*, in *Spinnrock*); the spindle is *ἀρχάζτη*, a word anciently used for arrow; and the spindle whorl is *σφρανδύλιον*. The two latter objects are respectively identical with the *fusus* and *vorticellum* of the Romans.



Fig. 48.—Stone necklace from a Neolithic necropolis near Hanau, Germany. The bodies had been cremated. Upon this site, above the remains of the Neolithic Age, were found successively deposits of the Bronze Age, the Hallstatt and La Tene Periods, and above these the remains of a Roman villa. (After Wolff in *Prähistorische Zeitschrift*.)

women of modern Bosnia and Dalmatia raise their sheep, shear and clean the wool, spin it into yarn with spindle and distaff, dye it with native dyes which they obtain from local plants, and finally weave it into fabrics, with which they clothe the family, producing beautiful results with the identical method perfected in early Neolithic times.

In weaving the new-found and pliant textiles, flax and wool, the old and simple stitches, learned in basket making, were undoubtedly the first to be employed, but the greater virtues of these finer and more flexible materials offered more possibilities, which the Neolithic women were not slow to take advantage of; and it may be assumed that the fabrics developed in the valleys of the Rhine and the Danube, when the horse was still free, and when the earth had not yielded up its metals, rivaled in beauty the products of the modern peasantry in countries where the primitive methods are still employed. The inherent love of decoration, which caused the men of Paleolithic times to paint their bodies with ochre and chalk, and to hang about their necks chains of shells or pendants formed of bear teeth, must have bloomed in these happier times into resplendent costumes, consisting of shirts, aprons and cloaks. Something, indeed, is already known concerning the Neolithic dress from certain terra cotta figurines, the markings on which plainly indicate clothing, and much is suggested by the costumes of the modern peasantry in the southeast, probably the direct lineal descendants of Neolithic garments.¹

¹ The fundamental garment for women, as developed in Europe, is the *shirt*, without sleeves, and coming about to the knees; this is made more complete by the use of either a

It is also to be remembered that, aside from the art strictly termed *weaving*, opportunity was given, now that flax and wool were utilized, for greater development of the allied branches of *sewing*, *knotting*, and *braiding*, and there is some definite indication that even *embroidery* was not wanting. Back in the Magdalenian are found slender bone and ivory needles, equipped with an eye at one end; and with such a tool the modern style of sewing became possible, replacing the more primitive method of first boring a hole with an awl and then putting the thread through with the fingers. The needle thus came a long time before linen thread

single heavy *apron* in front, or two of them, one in front, and one behind. These aprons, still found in the country parts of Greece, Macedonia, and Dalmatia, are unshaped squares of wool, about two and a half feet long by two broad, woven of gay colors and in intricate patterns. At the upper end the sides are folded over a little, making the square a bit narrower at the waist. These, although thick and heavy, are worn summer and winter, the lower part of the shirt serving as a petticoat. The next step was undoubtedly the formation of a *skirt*, by sewing together the free edges of the apron, and in this way the essential pieces of European woman's costume became established. For men the fundamental garment was also a shirt, made a little tighter than that of the women, and, as it was often the sole garment except the breech-cloth, it was usually colored and bordered, the Roman "tunic" and the Greek *ἱμάτιον*. The garment over this was not an apron, but a loose web of cloth, or shawl, folded and wrapped as the wearer desired, the "toga" of the Romans, and the *χιτών* of the Greeks. In both sexes shoes and stockings were developed independently of the rest, and in southern Europe have been, until recently, of little consequence. Naturally the shoe is much the earliest, in the form of either a sandal or a moccasin, the first a thick sole made of wood or leather strapped to the foot, the second a leather bag, without much success at shaping, the *opanka* of the modern Croatian peasant. These have always been worn far more by the men than by the women, since the former go over rough new country, while the latter walk mainly along well worn paths, in farmyards and cleared pastures, and in the house.

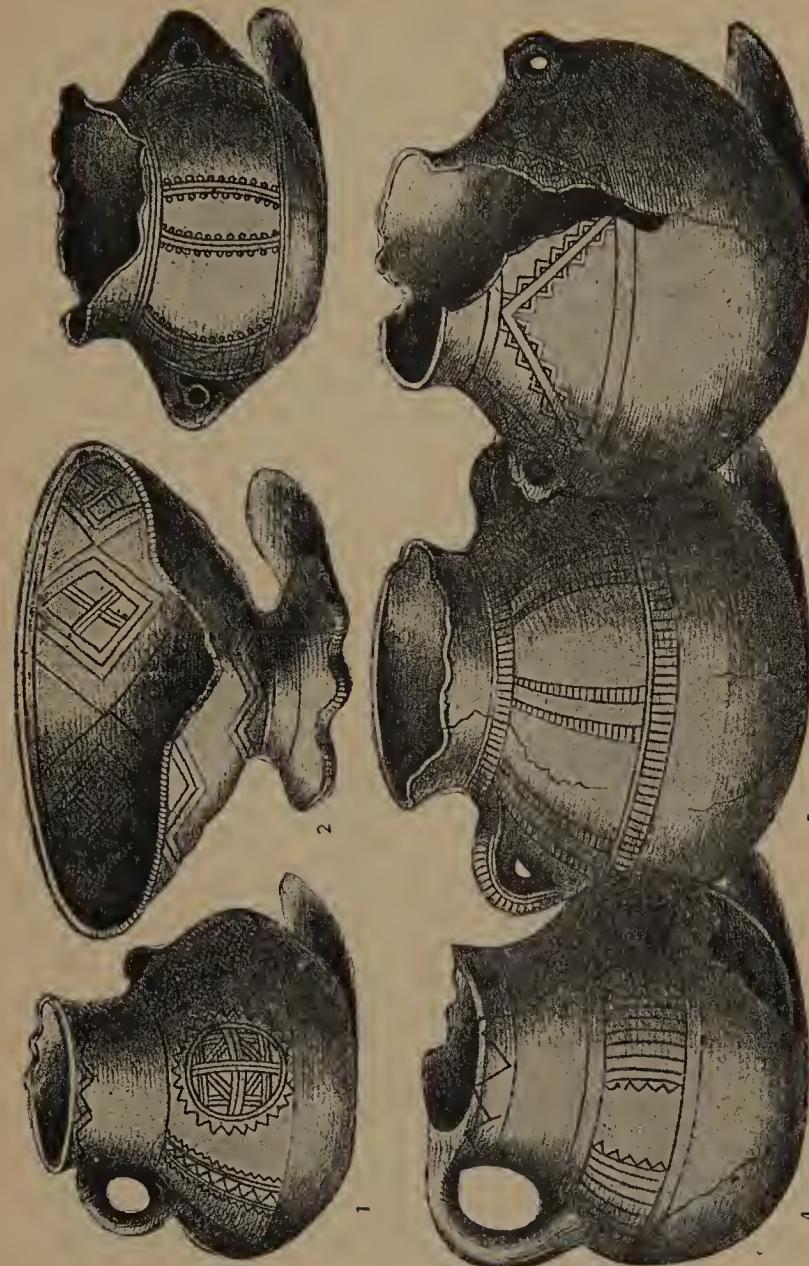


Fig. 49.—Decorated Neolithic pottery from the Laibach moor in Carniola, Jugoslavia. (After Forrer.)

was found, and while the woman of the late Paleolithic had probably nothing better to sew with than the sinews of animals, their Neolithic granddaughters, equipped with the same needle, but with a vastly improved thread, could naturally apply this art far more effectually.

46. *The Neolithic Age; the Ceramic Art.*—We have already derived the primitive basket from the walls and roof of the woven hut, and have seen how such a basket lined with clay, serves as a receptacle for water. Such a receptacle, with the enclosed water kept at a boiling temperature by the introduction of stones heated in the fire—the primitive method—would serve as an ideal boiling pot, and would replace the more primitive hollow in the clay floor, or the similar one in other sorts of soil, lined with a piece of hide. But the natural result of heat in hardening the clay itself would not long escape notice, and soon the fire might be used directly for this purpose. At first no one knew how to make a pot without a preliminary basket, but the effect of heat would be not only to harden the clay more and more, but to burn off the wicker-work, and leave the hardened clay by itself. Thus by accident the pot, apart from the basket, became a reality, and, although it still required many generations of early artisans to learn to build a pot directly, without weaving a basket first, yet it was learned eventually, and the trade of the potter became an independent calling.

As the early pots naturally showed the impression of the basket which then surrounded them, the art of constructing a pot directly from the clay produced so smooth and bare looking a result that the need was felt of re-

lieving this by imitating the former stitch, and there thus arose the art of pot decoration. In primitive cases this took the form of stamping the surface with little paddles wound with strips of sinew, imitating weaving; sometimes the surface was rolled over with little wooden wheels or cylinders with notched edges or surfaces or in still other cases the lost basket impression was suggested by lines made freehand. It appears, too, that the earlier pots, being rather fragile, were often protected by enclosing them in a bag made of a circular piece of skin, which was

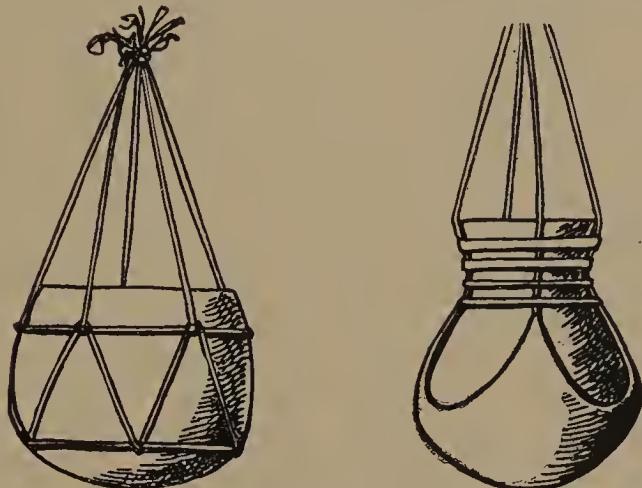


Fig. 50.—Two methods of suspending a Neolithic pot, from which certain of the characteristics of the ornamentation may have been derived. (After Forrer.)

drawn up over the top at regular intervals, forming points by which the pot could be suspended. This enclosing case naturally marked the soft surface of the clay in a diagonal zigzag line, and developed points and triangles near the top; and this pattern, also, the Neolithic potters often imitated by lines traced with the bone, so often, in fact, that decoration on the basis of trian-

gular areas became one of the ruling motives among early pottery. The accidental markings made by the fingers suggested frequently the use of these ever present tools for decorating, and many a woman in a Neolithic farmstead has left this form of personal record; sometimes a row of small round concavities, or dells; sometimes the parenthesis-like curve of the finger nail, repeated as a row of parallel curved lines. The typical handle, or "ear," in the form of a loop, so indispensable in the jars and pitchers of to-day, was a Neolithic achievement, and its development may be found in all of its stages, in any large Neolithic deposit. At first a mere raised ornament, or low knob, repeated at frequent intervals around the shoulder of the jar, it soon became of use in the attachment of the cords that suspended the pot above the fire. This use naturally developed these knobs in size and amount of projection, but reduced their number, until they became limited to four, or even three, to which the suspensory cords were directly attached. When this stage was reached, the attachment was made still easier by boring a hole through the knob, and such a hole, accidentally made and large enough to admit the finger, proved of value in lifting the pot with the hands. The final step from this point consists mainly in enlarging the hole, with the attendant changes in the form and size of the entire knob, and the handle, as used to-day, is finished.

The development in form, although not very extensive in comparison with a later date, still showed, during the Neolithic, more than an initial activity. Once away from the limitations of the early basket, the form was limited only by the physical properties of the clay and the ability

of the potter, and thus a series of forms developed, ranging from tall jars to flat saucer, some restricted above into a neck, others cylindrical, or flaring. The inconvenience of the round bottom, the more primitive form, became early manifest, and the defect was remedied sometimes by the addition of knob-like legs, as in certain types of modern iron kettles, or sometimes by setting the pot into a ring of clay, and welding the two together. This last soon developed into a flat bottom, with a slight flare at the edges.

Thus, although certain methods of finish and decoration, unknown to the people of the Neolithic, were the product of later ages, and although the introduction of the potter's wheel was to revolutionize the method of manufacture, it is yet seen that the main lines of later development were already laid down, and that certain of the essential features, introduced at that time, were not to be improved, even at the present day.

47. *The Neolithic Age; Masculine Activities.*—While now the women of the Neolithic Age were developing the arts of agriculture, weaving and pottery, and domesticating and caring for the most essential of the domestic animals, the men were far from idle.

For them there were still, as ever, the pursuits of hunting and fishing, the providing for defense against their enemies, and an occasional raid against those of their neighbors with whom they had, fancied that they had, or perhaps hoped to have, some grievance. It was true that owing to the valiant struggles of their predecessors, there was no longer the menace of dangerous brutes, for the cave-bear was long since dead, and save for an occasional encounter with an infuriated ur, or an elk at bay,

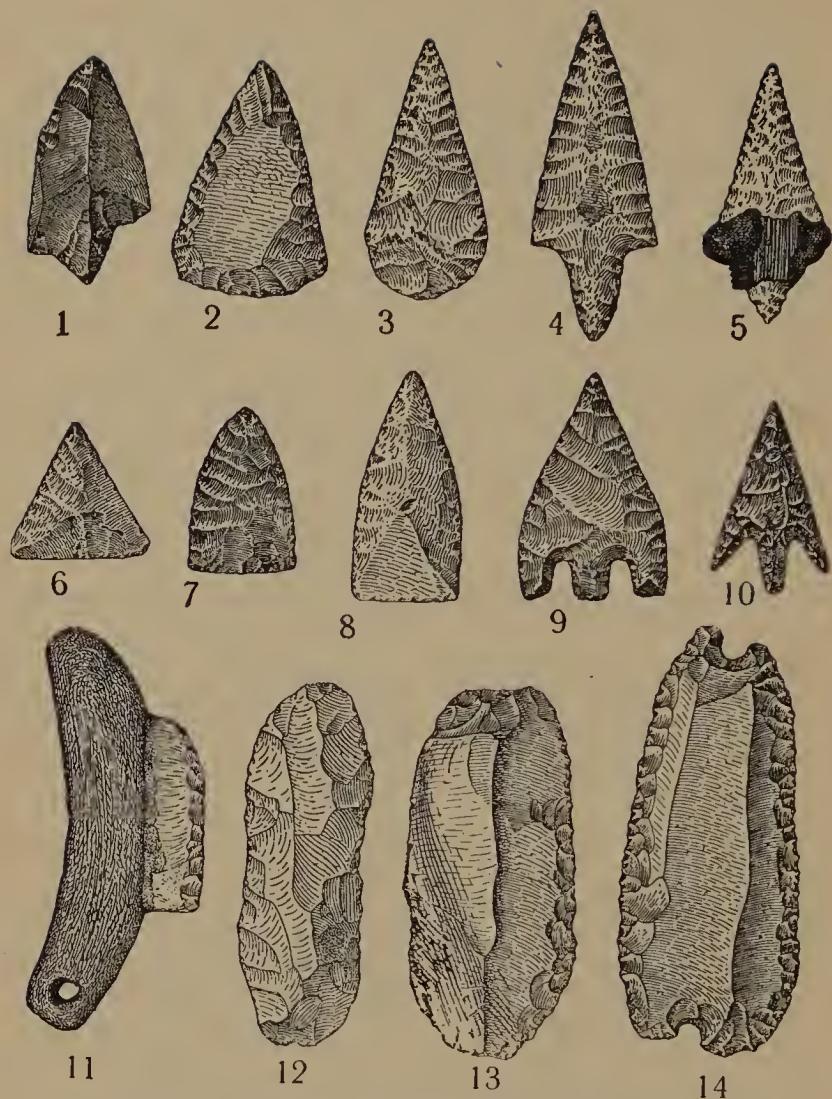


Fig. 51.—Neolithic arrow heads and other stone implements from Swiss lake dwellings. No. 5 is still covered with asphalt, used for attaching the stone to the wooden shaft, and No. 11 is a stone knife or saw, still fastened to its wooden handle by the same substance. (After Forrer.)

hunting had well-nigh sunk to the level of a routine trade; yet, true to the instincts of the race, with the general advance along other lines, the arts of war, as practiced against their fellow men, became developed also; and the men whose descendants of the distant future were to deck their ships with steel plates, and equip them with high explosives and terrific engines of wholesale destruction, were not remiss in matching cunning and strength with one another in improved methods of attack and defense. It was mostly men of Neolithic times who erected, over vast districts in Europe, those fortresses or *refugia*, which consist of improving the defensive strength of natural hills by means of walls and ramparts and the structures variously known as scharrachs, wallburge, hradiste, etc., previously mentioned (§§ 17, 18, 42) and many of the crannogs or fortified islands, also, although used by later men, were originally built up and fortified during the Neolithic Age. Indications point, in fact, to an age, not by any means wholly pastoral or agricultural, but an age also of invasion, of unrest, probably of great tribal movements, the courses of which may never be satisfactorily worked out.

In another direction, also, very different in character from that followed by the arts of war, the men of the Neolithic Age were extremely active, and the results have ever since served to awaken the admiration and surprise, not to say awe, of all succeeding generations. This is in the erection of those huge monolithic structures which occur in great abundance in various parts of Europe, and range in complexity from single pieces, standing on end, like obelisks, to great systems, arranged in rows, circles, and other definite forms, and covering a

territory hundreds of acres in area (§§ 20, 22). Many of these were definitely tombs, and may have formed originally the core or framework of artificial mounds or tumuli, the removal of which through natural erosion brought the stone structure again to light. Others, especially the largest and most complex, were certainly temples, with the essential attributes of all temples: (1) a majestic approach, (2) an antechamber, and (3) an inner sanctuary. Even in these cases, however, an original mortuary purpose is by no means excluded, as these structures may have been erected to honor some deified hero of forgotten antiquity, and may thus have served as tomb and temple at one and the same time. The enormous quantity of these megalithic structures, scattered in rather definite areas over Europe and Northern Africa, points to the existence of a widespread and powerful cult, in the observance of which the people put forth their best energies and employed their highest efforts.

In general, the men of the Neolithic Age placed their dead in the ground, the manner of disposal showing a great variety of methods. Sometimes they were laid upon their backs or sides in a perfectly straight position; sometimes they were placed on their sides in the well-known "*Hockerstellung*," that is, doubled up, with the knees approaching the chin; and again, various types of urn-burial are not infrequent, in which either the folded body, or the dismembered bones, are placed in a huge urn, and enclosed in a rough tomb composed of a circle of large stones. The cist-grave, made of flat stone slabs, in the form of a rectangle, with floor and roof as well as sides, is also no unusual occurrence. In

most cases, also as has been the almost universal custom among all humanity, various personal possessions, both ornaments and weapons, were laid with the body, and often, too, one or more utensils containing food. Judging from the mortuary customs of living races, among whom almost every Neolithic method may still be found somewhere, these various customs are adopted neither by chance nor wholly as utilitarian, but possess a definite religious significance, and point not only to the existence of complicated rituals, such as exist to-day among the American aborigines, but to a considerable diversity of rites, which, judging from primitive people of the present day, points in its turn to a similar diversity of race and probably language.

48. *Megalithic Temples*.—In several localities of western Europe combinations of various types of megaliths, such as alignments, triliths, and cromlechs, consisting of hundreds or even thousands of separate stones, and extending over a considerable territory, are so placed as to form a definite architectural plan. Moreover, since these structures either consist of, or become focused in, a system of stone circles, which seems to form an inner enclosure of worship, it may not be too presumptuous to see in such architectural plans actual temples, with roads leading to them, and other accessories.

Three of these are especially extensive, and deserve particular notice, those of *Stonehenge* and *Avebury*, in Wiltshire, England, and that of *Carnac-Ménac* in Brittany, near the coast. Of these the latter, which is the most extensive in area, and consists of the largest number of separate megaliths, may be first considered. It begins with eleven parallel rows of huge menhirs—*i.e.*,

alignments, which run almost exactly east and west for a distance of about three kilometers. The separate menhirs vary in height from six meters down to a half meter, and define a series of parallel avenues across the plain. About eleven hundred and seventy stones are still in place, but originally the total number in these alignments must have been not far from two thousand. Toward the western end these great avenues became cut off by short alignments running across the longitudinal ones, and both these and the cross rows were here probably once connected by masonry, forming a series of rectangular rooms or courts. Beyond these in turn, the alignments terminate in the remains of a vast stone circle, or rather two concentric circles, which may be identified as the temple proper. Unfortunately, a large part of this has been quarried for building material, and now forms the modern village of Ménae, which is situated within the enclosure, so that the original plan of this, the most essential part of the whole, is hard to follow.

The architectural plan of Carnae is thus strongly suggestive of a vast temple with a long approach, and involuntarily suggests that other Karnak¹ in Egypt, where the idea crudely suggested by the first is carried out with the potent addition of the sculptor's skill. The rough-hewn stones of the one have changed to erouehing sphinxes, between which the worshipper walks toward the terminal temple, where the unshaped menhirs have become symmetrical columns with lotus capitals; yet the

¹ Is this resemblance in name wholly accidental? If a pure coincidence it is certainly a remarkable one, when we consider also the singular parallelism in the structures for which both are famous.

plan is similar, and the Breton Carnac in actual size is much superior to the other.

As the solitary menhir probably developed into the finished obelisk, so the passage from the eromleeh or rude stone circle to the temples of Egypt and Greece is equally simple. The uprights, when shaped, become columns, and in certain cases, like the so-called Temple of Vesta at Rome, retain the primitive circular arrangement. With the change of ground plan from the circle to the rectangle comes the pediment, and with the great advance in the production and employment of building materials comes the possibility of a roof, a feature already employed in the case of the dolmen, but in this monolithic form, utterly impossible for large structures.

Of the two great British megalithic structures, Avebury and Stonehenge, the former is much the larger in ground plan, but the latter is the better preserved. At Avebury the central temple consists first of a mighty eromleeh, twelve hundred feet in diameter, composed of one hundred separate stones, each five or six meters high; then, within this, two smaller eromleehs, each double, with a few separate menhirs filling the center. Of these lesser eromleehs the outer circle contains thirty stones and the inner twelve, in each case. Extending from each side of this complex central edifice pass two avenues, each formed of a double alignment of menhirs, in nearly opposite directions, to terminate, at a distance of a half mile or more from the great central eromleeh, in two lesser terminal cromleehs, each double, like those within the central circle, and about four hundred and fifty meters in diameter. One of these terminal cromleehs is still in fair preservation, the other

has beeome nearly destroyed in building the village of Avebury which is situated almost entirely within its area. Plaeed in striet aeeordanee with this eolossal ground plan, and just within the sheltering arms of the two lateral avenues, and at equal distanees from each, onee stood the artifieial mound known as "Silbury Hill," one hundred and thirty feet in height, and covering five and a half aeres, easily the largest artifieial mound in Europe.¹

Stonehenge, so much smaller than Avebury that Aubrey, in 1665, could write that the latter "as much exceeds Stonehenge as a cathedral does a parish chureh," is yet superior to it as a ruin—that is, it is more complete, and stands out upon the plain in such a way as to produce a powerful impression of solitary grandeur.

¹ The structure at Avebury is now in a very bad state of preservation, so bad, indeed, that the original plan is difficult to make out, and allows an opportunity for differences of opinion. According to the investigations of Stukeley, in the middle of the eighteenth century, the entire ground plan presents the form of the conventionalized head of a steer or cow, the central temple forming the head, and the two lateral avenues, gently curving and becoming narrower toward the ends, the horns. These are tipped by two small cromlechs.

It is quite possible that Stukeley, writing nearly two hundred years ago, possessed data now destroyed, but at present the indications of such a plan are faint at best, and some openly disbelieve it. Thus Schuchhardt, who went carefully over the structure in 1910, finds but one of the two great lateral avenues, the one leading east; but, on the other hand, discovers traces of a second street leading southeast to an ancient settlement upon the river Kennet. The main struture he finds in much the same form as have others; a great stone circle, enclosing two smaller circles, one with one, the other with three monoliths in the center. *He also considers both Stonehenge and Avebury to have been memorial monuments rather than temples*, on the ground that they are premycenaean in culture, and that even as late as the Mycenaean Period no true temples are found. Cf. Schuchhardt, C., "Stonehenge," in *Prähistorische Zeitschrift*, Bd. II, 1910, pp. 292-340.

It possessed, in its original condition, an outer circle of thirty very large menhirs, probably capped entirely around, from one to another, with horizontal pieces forming architraves. Just within this was a slightly smaller circle of thirty low menhirs, less than half the size of

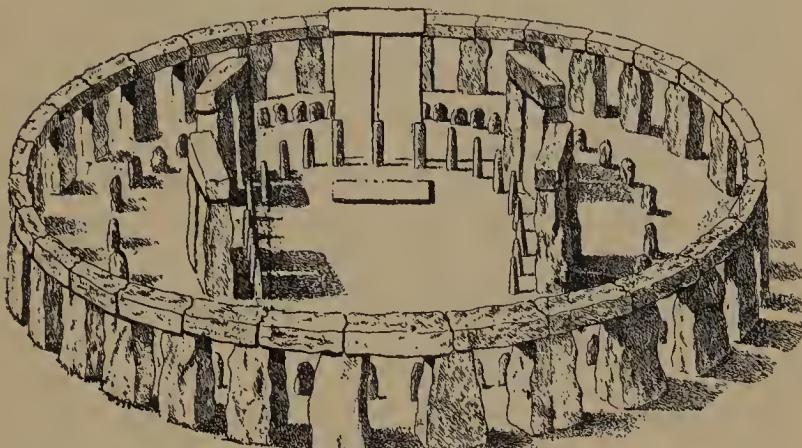


Fig. 52.—Stonehenge, on Salisbury Plain, England, restored. It consisted originally of an outer circle of stones, connected by architraves, and measuring some 13 feet in height, which surrounds certain inner structures, the most noticeable features of which are five gigantic triliths, each of two uprights and a cross piece. With the cross pieces these triliths stand at a height of between 19 and 26 feet. Within the triliths again is an oval of rather small uprights, and near one end, at about one focus of the oval, is placed a flat stone, usually considered to be an altar. The whole is thought to be a temple, but may have also been a tomb or a mausoleum, erected to the individual who was afterwards worshiped there. Hundreds of graves, some of them in the form of mounds, occur in the immediate neighborhood of Stonehenge, and date mostly from the early Bronze Age. (From Schuchart, after Browne, 1834, in *Praehistorische Zeitschrift*.)

the others, and without cap pieces. Within this, again, there stood five mighty triliths, the largest stones in the entire structure, of which one formed the head, and the others the sides of a great oblong figure, a horizontally placed arch. Within this was a second row of small menhirs, forming also a loop or arch. In the innermost enclosure, near the trilith called here the head, was

placed a large square stone with a flat top, strongly suggestive of an altar.

Here, in these extensive structures, as well as in the case of isolated menhirs, there comes naturally the question of the way in which these enormous blocks of stone could have been moved and finally set in place. In the handling of these pieces it is probable that rollers and pulleys played a considerable part, but much was undoubtedly accomplished by excavations and the formation of earth mounds. Thus, to set a menhir it would be necessary only, when the stone was once brought to the right place, to excavate a large pit beneath one end, involving slightly more than half the total weight. When completed, the stone, by mere force of gravitation, would drop into the excavation, and, at the same time, assume a nearly erect position, which could be completed by means of a pulley, and without much further effort. The fact that in most cases the heaviest portion of the menhir is beneath the surface of the ground, seems to corroborate this theory. If, now, a sloping wall of earth were banked along one side of a row of menhirs when once set, an inclined plane would be presented, up which cap stones could be rolled into place upon the tops of the uprights, and when once correctly set the removal of the earth would leave the whole as at present. This suggestion receives support from the presence of such a rampart along the outer side of the great outer circle at Avebury, although there is here no suggestion of an attempt to cap the uprights.

Concerning the data of construction and use of these and other megalithic structures, a little light has been shed through excavation in the neighborhood, and by

the examination of associated graves. Thus, within three miles around Stonehenge there are about three hundred burial mounds, which, when opened, are shown to be of the early Bronze Age. Other writers are inclined to consider the great megalithic structure considerably older than the graves, and refer these huge ruins to the late Neolithic. It is quite probable, however, that all do not belong to the same time, and that megalithic construction, begun in the Neolithic, continued thereafter for a very long time; it is also possible that in places the men of the Bronze Age have used these monuments of an earlier time, just as, at present, in various parts of France, ancient dolmens have become chapels for Christian worship. These structures certainly antedate by a very long period any historic record, and belong to the prehistoric. Nestor, at the burial of Patroclus, defines to his son the course for the chariot race, a part of the funeral games:

“On either side

Where narrowest is the way, and all the course
Around is smooth, rise two white stones, set there
To mark the tomb of someone long since dead,
Or form a goal for men in ages past.¹

and in the same way the modern visitor at Stonehenge or Avebury stands in the presence of the monuments of a forgotten antiquity.

As a matter of curiosity, however, a Scotchman named Fergusson, who wrote as late as 1873, and whose careful and detailed descriptions of British megaliths have made

¹ Quoted from Sir John Lubbock (Lord Avebury), in “Prehistoric Times,” 6th ed. p. 10. In the next few pages he discusses the probable date of Stonehenge.

him a recognized authority on the subject, has given a ridiculously recent date to all of them, declaring both Stonehenge and Avebury to be not only not prehistoric, but actually post-Roman, and associates certain of them with the battles fought by the semi-mythical King Arthur and the knights of his Round Table!

49. *The First Metals; the Cyprolithic Age.*—Such a religious development as that indicated by the temples and tombs was in great part a masculine activity, for in all historic cases it is the men who establish the beliefs and devise the rites. In certain of the best established religions of the present day, women either play no part at all, or are suffered to appear as auditors at certain times only. Except in a few specific cases, the priests, especially the chief ones, belong to the male sex, and where there are institutions of priestesses, they form only a part of a larger cult controlled by men. Priests and nobles, among primitive civilizations, are usually in sympathy, and the high priest and the king are often identical. The late Neolithic form of government was most likely a hierarchy, and the number and complexity of the various ceremonials very great.

And it was among such a civilization, to people with flocks and herds, to people who could spin and weave and make pots, that a new substance called *copper* gradually made its way from the southeast through the channels of commerce, the forerunner of the series of metals, the use of which was destined to give the final impetus to civilization. Copper, like gold, silver, and a few other metals, occurs occasionally in the free state, uncombined with other elements. Pieces of these free metals, gold especially, had naturally long attracted at-

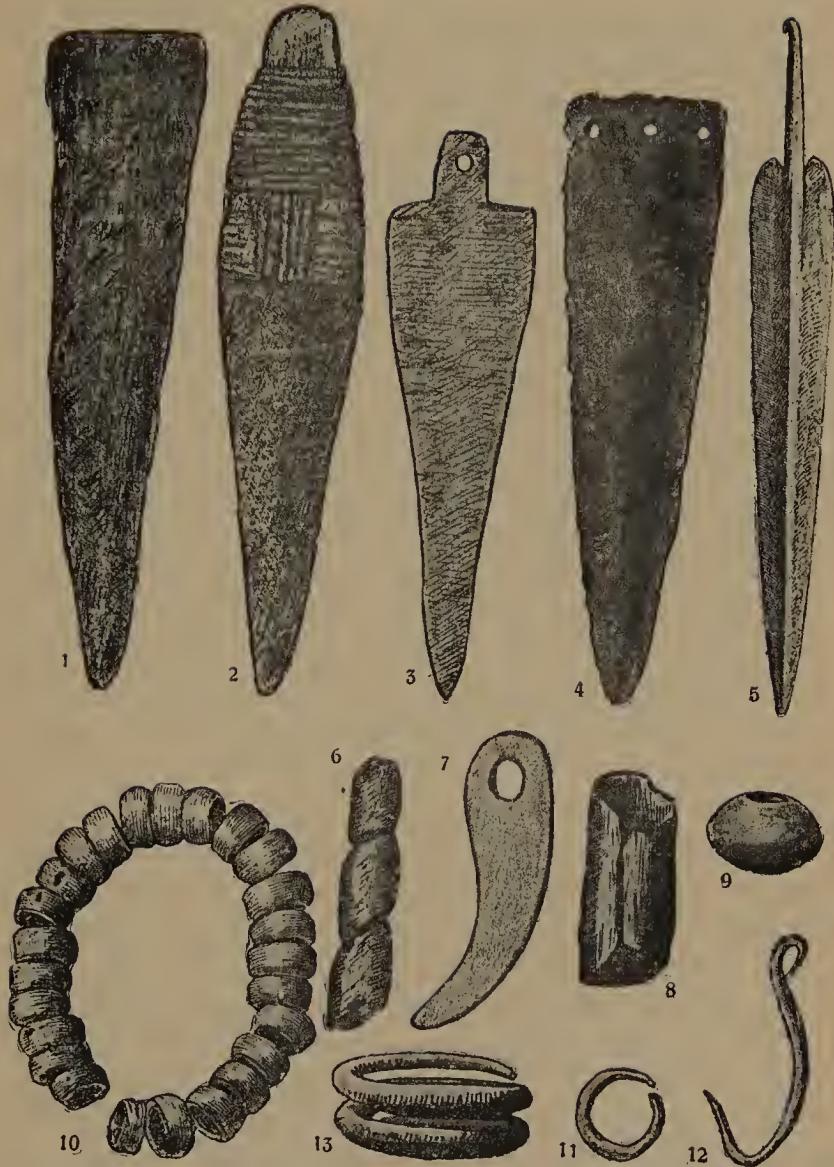


Fig. 53.—Copper implements from the Cyprolithic Age of Central Europe. (1-5), dagger blades; (6-9), beads and pendants; (10), necklace of copper beads; (11, 13), finger-rings; (12), fish-hook. (After Forrer.)

tention, and gold nuggets are occasionally met with in Neolithic graves, together with pearls and precious stones, and used solely as ornaments. In the island of Crete, where free native copper is obtainable, this metal also was used during the Stone Age for the same purpose, and here first, according to many authorities, experiments were made in beating it out between stones. This had been the treatment accorded from the earliest times to stones from which implements were to be made, but in the case of this new material the results were radically different. Instead of striking off flakes here and there, as in all former experiments, the artisans succeeded only in pounding it out into plates, or drawing it out into wire, the one not very thin, and the other not very delicate; yet they, especially the last, opened up new possibilities of manufacture. The results appear in early Cretan graves in the form of spiral rings and long pins for fastening clothing, usually with a crude twist or spiral for a head; also in a certain type of lance or short sword.

Pieces of this malleable metal soon found their way to the continent, presumably first along the eastern shores of the Mediterranean; and up the valley of the Danube, and from thence gradually but surely, this material became disseminated even to the farthest confines of Europe. Its advent was, of course, much earlier in the South, and had barely reached Scandinavia at a time when it had already come into quite general use in the Mediterranean lands. At first employed only for ornaments, and solely the possessions of the rich, it gradually became used in the making of knives and lance heads, and, whenever possible, replaced the imple-

ments of stone. These early copper artifacts were crudely hammered out upon stone anvils, and in many cases, as was natural, were good copies of stone implements, both in shape and size. Others struck out into new lines rendered possible by the qualities of this new material, and produced utensils made of thin plates, perforated with holes for attachment to handles; in both characters definite departures from previous lines of manufacture, as such things would not be possible in stone. The readiness with which this new substance could be beaten out into the form of a wire, still retaining its tenacity, was early seen, and later in Germany and France, as earlier in Crete, such pieces were wound into small spirals to adorn the fingers, and twisted into more utilitarian shapes such as fishhooks.

As the advantages of this new material became continually more manifest, men all over Europe were stimulated to search their native mountains for pieces of the same metal, and in several places, as in Hungary, the province of Salzburg in Austria, and in Spain, successful copper mines were opened, where the mining was accomplished by implements of wood and stone; and the rock broken by huge stone hammers. Mining operations for extracting flint had long been known (e. g., at Spiennes, during the late Paleolithic), so that men were quite ready, when the demand became sufficient, to delve in the earth for this new metal, and follow veins of it through the rock.¹

At about this time, too, probably as a direct result of the search for copper, a new malleable metal was

¹ Sophus Müller: "Urgeschichte Europas," p. 47.

found in the distant island of Britain, and from that center became gradually disseminated over continental Europe. This metal, tin, while nearly or quite as malleable as copper, was soon found to be more brittle, and hence was not as serviceable for tools and weapons; but, on the other hand, its white color and silvery lustre, which contrasted so strikingly with copper, and perhaps also with the dark skins of the people, brought it into much favor for personal decoration.

While now, the introduction of copper and tin in small quantities, mainly as objects of adornment, left the people for a short time still in pure Neolithic surroundings, the continued increase of these metals, especially the inevitable replacement of stone implements by metallic ones, eventually effected a marked change in their culture, especially in that aspect of it exhibited to the archeologist. The people had become *Cyprolithic*; they used both flint and copper, but *employed the latter precisely as a stone*, beating it into shape by hand, upon stone anvils, by methods not very different from those employed in shaping flints.

This stage, however, was of short duration—as some think, and with considerable right, far too short a stage to serve as the basis of one of the main subdivisions of prehistoric chronology—and seems rather a transition to the next period than a period in itself. The passage over into the definite “Age of Bronze” was effected mainly through the dissemination of two new inventions: (1) that of melting the metals, and *casting* them in stone molds, and (2) that of *smelting*, or obtaining the pure metals from their ores.

50. *Casting and Smelting; the Advent of Bronze.*—

Just how or where the men of Europe first learned that copper and tin would melt in a hot fire, and that, when molten, they could be poured into molds, the shape of which they would retain permanently and in every detail when cooled again, is not definitely known, but both of these metals, with which man did his chief early experimenting, have a low melting point, and there must have been frequent cause to observe this phenomenon, through the effect of the hearth fire upon objects of copper and tin that accidentally found their way among the coals. This experience is so natural, and its teachings so plain, that the invention must have been independently made in many parts of the continent at about the same time; and thus, within a short period, implements of molded or cast metal soon replaced those that were beaten out in the old way. The molds were cut out of soft stone, made of two pieces pinned together, and when once equipped, and supplied with sufficient raw material, a primitive workshop, employing but three or four hands, could turn out copper implements, the exact duplicates of one another, with great rapidity.

The next step, equally spontaneous, occurred one day when, in some such primitive shop, the founder, finding his supply of copper running low, threw a little tin into his melting pot with the copper, and found, to his great surprise, that the finished material was unlike that formed of either metal alone, but that it united the tenacity of copper to the hardness of tin, so that a hard blow could be dealt without either turning the edge or causing the weapon to shiver into pieces. The color, too, was a pleasing one, intermediate between the two

original materials, and men saw, for the first time, *bronze, an alloy of copper and tin.*

A second great advance, resulting from these simple metallurgic operations, was the discovery of smelting, a process through which the metal could be obtained from certain of its ores. Although the metals commonly used, copper and tin, occur in very limited quantities in the free state their ores, minerals in which the metal occurs in chemical combination with other elements, are frequently found in abundance. Of these ores, the simplest are the oxides and sulphides, which demand for their reduction nothing more than the mixing of the pulverized ore with charcoal, and the subjection of the mixture to a considerable degree of heat. Since these oxides often occur in the course of primitive metal working, such a reduction, at least on a small scale, would occasionally catch the eye of the smith. These processes demanded a higher temperature than that required simply to fuse the pure metals, and for this purpose a primitive blast furnace became developed, with the bag-like skin of an animal for bellows, such as is still in use among the native smiths of central Africa. This apparatus, in itself merely a mechanical lung for blowing the fire, and thus augmenting the force of the heat, is but a simple invention, and was used in all probability in the process of melting the free metals before its employment to aid in the reduction of ores; but with the knowledge of simple smelting operations, this bellows became of greater importance, and became eventually fitted with a frame and worked by a lever.

This gradual increase of discovery and invention, com-

bined with the renewed zeal of the miners, multiplied the amount of available metal many fold. It gradually, but surely, replaced the less efficient stone implements, not of the wealthy and powerful only, but eventually of the lower classes as well; and as a direct result stimulated every industry by supplying them with better tools. The combination of copper and tin, *bronze*, had by this time replaced the use of either metal alone for most purposes. In the earliest bronze implements, for example, there is too much copper for the greatest efficiency (95.5 per cent), but soon the proportion of tin increased to 10.12 per cent, the usual proportion. Toward the end of the bronze period a part of the tin was replaced by the newly found metal, lead, and the proportion of copper, tin and lead used for most purposes became about 88:7:5, respectively.

The gradual introduction, first of copper, and then of bronze, with the consequent dropping off in the earlier materials, is shown by the help of the accompanying table, which gives the proportionate number of artifacts of stone, copper and bronze during the periods involved in the transition.¹

Period	Percentage of Stone	Copper	Bronze
Early Neolithic	100	0	0
Middle Neolithic	99	1	0
Late Neolithic	90	10	0
Cyprolithic (1st phase).....	75	25	0
Cyprolithic (2nd phase).....	50	50	0
Cyprolithic (3rd Phase).....	40	50	10
Earliest Bronze	30	30	40
Early Bronze	15	15	70
Middle Bronze	3	3	94

¹ Robt. Forrer, "Urgeschichte des Europäers," p. 319.

51. *The Bronze Age.*¹—With the Age of Bronze we enter the outer portals of history, for the art of writing appeared in Europe at about this time, coming from the mysterious East, and the priests and scribes began to record their annals. When then they first took up the pen to write down the tribal memories of the past, they wrote of the Bronze Age, putting into lasting form traditions that had long been transmitted only through the faulty memories of men accustomed to the marvelous. Their poets, wont to entertain the men assembled in the banquet hall with tales of Bronze Age heroes, and to sing of Achilles, Beowulf and Siegfried, now recorded their songs, with the actual facts, already half-forgotten and distorted in their own favor, upon the dried entrails of sheep, or upon the flat walls of temples. Thus arose the first written literature, such as the Iliad, Siegfried, and the Song of Roland, and the scenes depicted in them give us invaluable glimpses of Bronze Age civilization. Although, in contrast to the Ages of Stone, the Bronze Age was a period of great advancement, or even of luxury, still, as compared with modern civilization, the times were barbarous in the extreme.

¹ For the study of the Bronze Age in detail, far too vast a field to be more than mentioned here, the reader may consult such older, comprehensive works as "Ancient Bronze Implements," by Sir John Evans; Paul du Chaillu, "The Viking Age"; or Montelius, "Die Chronologie der ältesten Bronzezeit in Nord Deutschland und Skandinavien." Such classics as Babcock's "Prehistoric Times," and Boyd-Dawkins's "Early Man in Britain," give much concerning the Bronze Age, and it must also be remembered that the Bronze Age activities form a large part of the labors of the classical archeologists, and that thus the study of prehistory has been greatly enriched by such excavations as those of Schliemann at Hissarlik (Troy) and Mycenæ, and those of Evans and the two Haweses in Crete.



Fig. 54.—Sword hilt and two daggers from the earliest Bronze Age in Scandinavia. (After Sophus Müller.)

Men enjoyed the lust of carnage, and gloated over the details of the bloodiest struggles; they celebrated the deaths of heroes by funeral games, and invoked the aid of the gods by the sacrifice of oxen, dismembered by priests in the sight of all the people. Even an occasional human sacrifice was advocated, like that of Iphigenia; or actually performed, like that of Jeph-

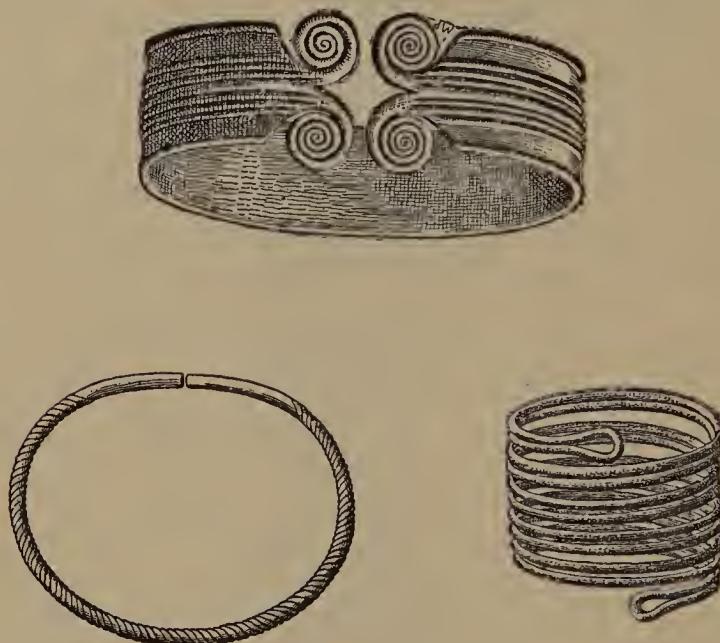


Fig. 55.—Gold bracelets from the Bronze Age, all Scandinavian. Above: heavy gold bracelet, worn by a warrior. Earliest Bronze Age. Below: two more delicate gold bracelets, also worn by men; later than the one above. (After S. Müller.)

thah's daughter; and the bodies of the bravest of foes were dishonored in the most shameful manner.

The banqueting halls of Odysseus were used in the intervals of the feasts as abattoirs for the slaughtering of oxen, and the floors were littered at all times by the

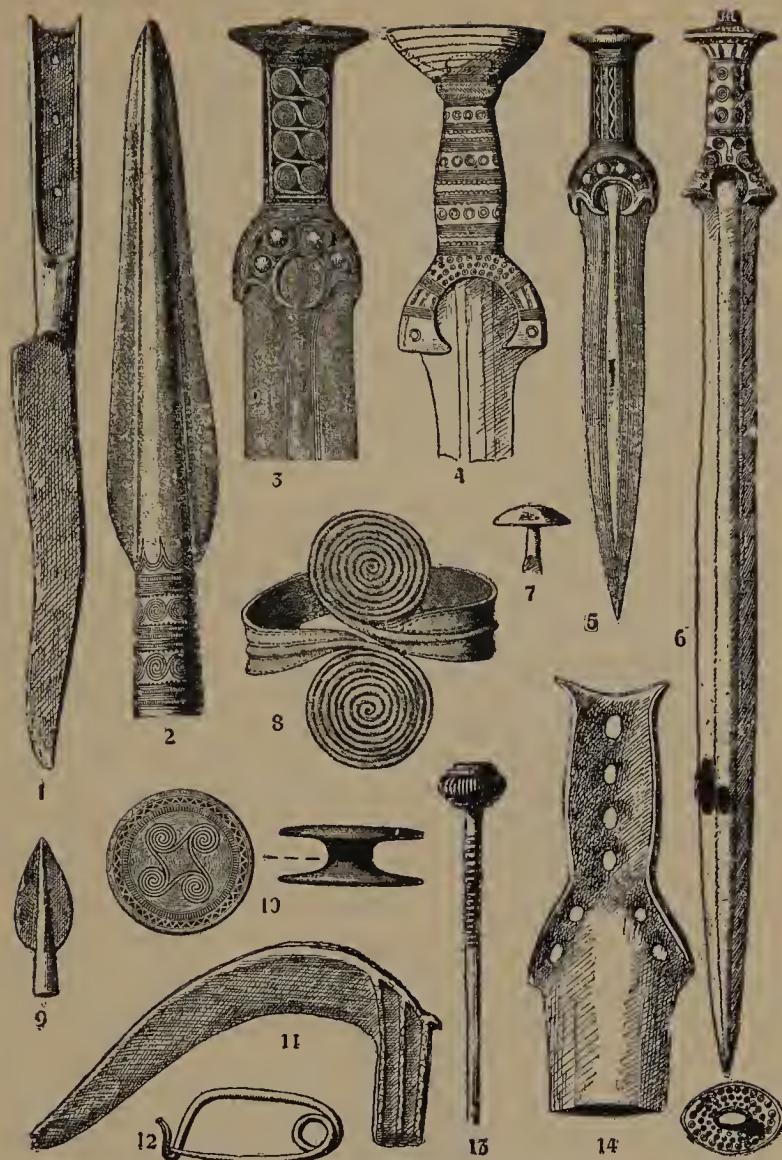


Fig. 56.—Bronze implements and weapons from the Middle Bronze Age in Central Europe. (1), knife; (2), lance, from Skane, Sweden; (3), sword-hilt, from West Gotland, Sweden; (4), sword-hilt, from Bohemia; (5), dagger, Scandinavia; (6), sword, Tyrol; (7), stud, Tyrol; (8), bracelet, Harthausen; (9), arrow-point, Switzerland; (10), two views of decorated stud, Sweden; (11), sickle, Hungary; (12), brooch, Wallishofen, Lake of Zurich, Switzerland; (13), hair-needle, Southern Germany; (14), sword-hilt, Lorraine. (After Forrer.)

hides and horns, left around apparently without any especial regard to the feelings of the banqueters. The laundry of King Alcinous was left to accumulate for many months, and was finally washed by the members of his own family, and carried to the shore in a gold-trimmed chariot! There was everywhere the greatest incongruity between the gold and jewels with which their utensils were decorated, and the menial occupations in which they were used; between the architectural splendors of the palaces, and the squalor of the life that went on within their walls.

During the Bronze Age there developed a high decorative art, and the implements, especially those of war, the constant companions of the warriors, became covered with the most intricate decorative engraving. Gold was possessed in considerable profusion; and in place of coinage, which had not yet appeared as such, this metal was made up into household utensils or personal ornaments, often of great beauty. Yet the possessors of these almost priceless splendors were often forced to live in caves, or in dwellings of rude construction, under circumstances which we of the present age, would not accord to paupers, or even criminals. The people possessed neither soap, bathtubs, nor tooth brushes; and the towns, and even walled cities, had no sewage system of any kind.

Aside from the ornaments, jewels and personal weapons worn or carried by the people of the Bronze Age, of which the legends often give detailed descriptions that are corroborated by excavation, especially that of tombs and graves, there had developed a complex and extensive costume, adapted to each sex, and suited to

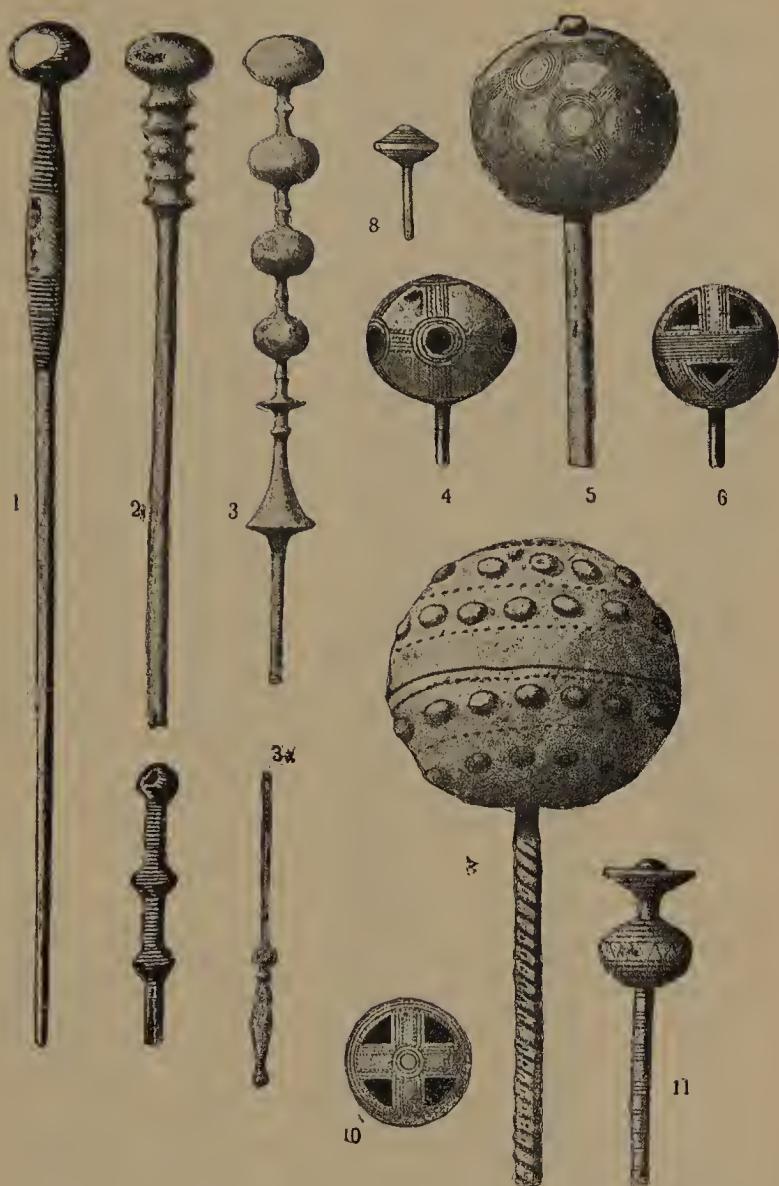


Fig. 57.—Late Bronze Age in Central Europe; bronze hair-needles.
(After Forrer.)

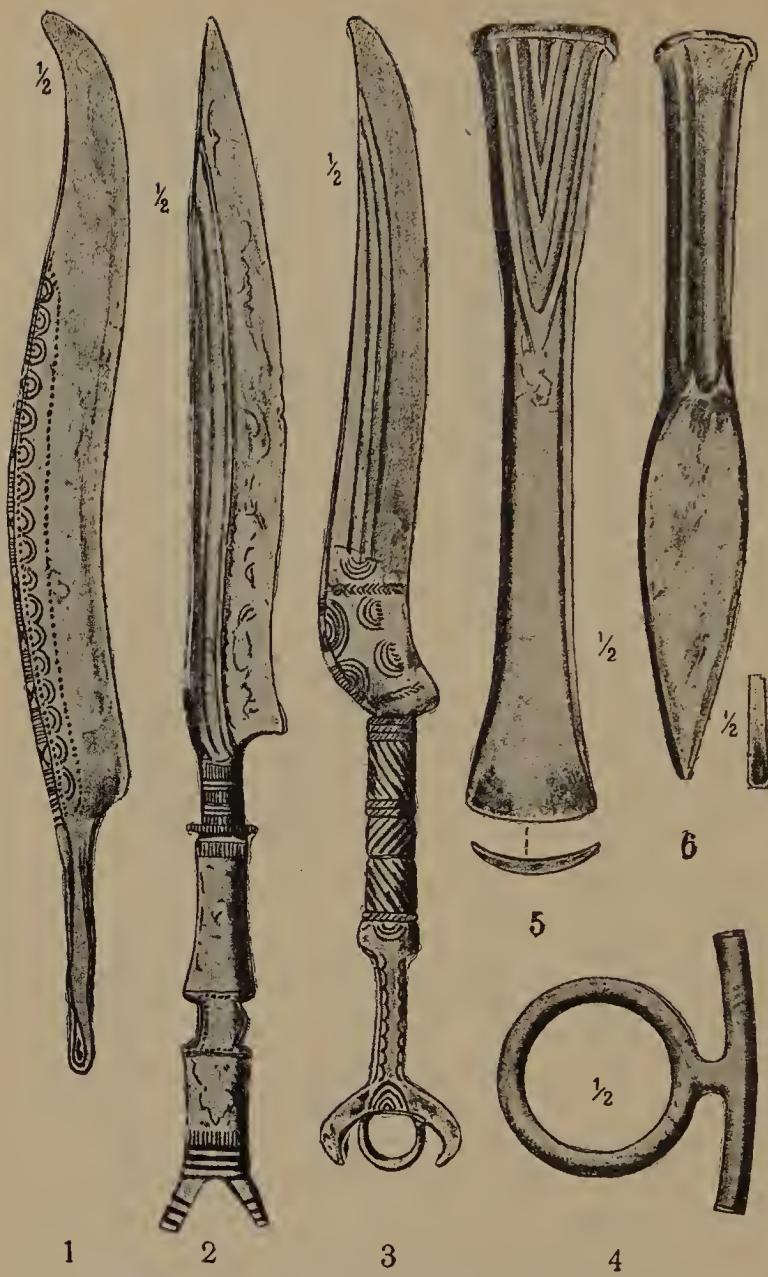


Fig. 58.—Implements from the Late Bronze Age; lake-dwellings of Wallishofen, Lake of Zurich, Switzerland. (After Forrer.)

the variations of climate and annual changes of temperature. Precise evidence concerning costumes in the Baltic region is furnished by the clothing on bodies found in the peat of Danish moors, enclosed in coffins made of hollow logs. This clothing, of wool or linen, consists of caps, cloaks, shirts and gowns, the latter gathered about the waist, and confined by a leathern girdle. Even nets for the hair, worn by the women, have been found. Unfortunately, however, the custom of burning the dead was widespread during the Bronze Age, and the numberless urns, containing calcined bones and ashes, although in themselves important documents for tracing the distribution of Bronze Age culture, leave us no information concerning either the clothing or the physical traits of the people themselves.

Much material from the Bronze Age has been obtained from Scandinavia and the Swiss lakes, where the sites of the pile dwellings, extensively used during the Neolithic, continued to be inhabited during at least a portion of this age. From the classical archeologists in Greece and Crete most valuable records have been furnished, especially those of the Mycenæan and Minoan civilizations; the first at Mycenæ, and the neighboring sites of Tiryns and Argos, in Peloponnesus, the latter at Knossos in Crete. About the first cluster the legends of King Agamemnon, and about the latter those of King Minos, with his famous labyrinth;¹ but while these

¹ It has been recently brought to light that the original Cretan word, rendered *λαβύρινθος* by the Greeks, has no suggestion of a maze in a cavern, or anything even remotely suggesting it, but was their regular word for the double-headed, or double-bladed, axe, the heraldic symbol of their country, or of their chief city. Thus, the entire myth of the Cretan labyrinth, with

legends are probably each of local origin in their respective localities, and perhaps refer even to actual Bronze Age rulers, the excavations mean vastly more than that, and reveal in many places, not only a long continued and probably illustrious Bronze Age civilization, but a previous long Neolithic period as well, antedating the former and extending to the third or fourth millennium before our era.

At the present time an extensive Bronze Age civilization is being unearthed in Austria, extending upward through Carinthia and westward to the Tyrol, also south and east along the Adriatic Sea. Of this, unlike Crete and the Peloponnesus, history has preserved nothing, not even traditions, and whatever is to be won must be accomplished through excavation alone.

52. *The Introduction of Iron.*—As the appearance of copper and tin throughout central Europe gives proof of at least the beginnings of an extensive commerce, so the extension of the bronze culture, with the close similarity in culture objects over the entire continent, shows this intercourse to have been continually maintained and gradually increased. Originating in the Orient, perhaps along the shores of Phœnicia, where, at the dawn of written history, we find the great center of the carrying trade, the goods from the East seem to have followed definite trade routes. Long before this time men had developed boats perhaps beginning in the lake villages of the Neolithic Age with floating logs, soon to be elaborated into crude canoes; and by the time of the Bronze Age large merchant canoes carrying goods, and pro-

the story of Theseus and Ariadne, had its origin, like so many other mythical stories, in a mistaken etymology.

pedoed at least by oars, if not by sails, rendered an easy communication along the shores quite possible. The Mediterranean Sea, with its numerous accessory gulfs and inlets, strewn thickly with islands, and with the coasts furnished with frequent harbors, offered exceptional facilities for the development of navigation, and the hardy mariners who first brought the copper from Cyprus to the mainland would find it quite possible, by creeping along the coasts, to reach, not only all parts of Greece, but Italy as well, and become eventually masters of the two great accessory seas, the Euxine and the Adriatic. Once possessed of the coasts, certain great rivers, like the Danube, and the Po, and later still, the Rhone, offered feasible routes into the interior of the country; and by the establishment of a few overland routes across the divides to the headwaters of other rivers, like the Loire and the Rhine, all parts of Europe could be reached. More than a hint concerning these early routes is contained in the story of the voyages of the Argonauts, in which there are suggestions of the Danube, the Straits of Gibraltar, the coast of France, and perhaps the Rhine and the Baltic, together with an account of transporting the ship bodily, by land route, by means of rollers, across a divide, from river to river. That such practices were actually resorted to in the Bronze Age, or a little later, has been shown by the discovery far inland of ancient ships, set on rollers, and evidently abandoned during such an attempt.

With all parts of Europe thus tied together by numerous trade routes, it is easy to understand how the various types of bronze implements became so generally distributed, and how the most distant parts seem to have

possessed similar equipment at about the same time. Through this almost simultaneous appearance everywhere of the new inventions and new types of implements, weapons and ornaments, it is possible with



Fig. 59.—Women's costumes in Scandinavia in the Early Bronze Age. This drawing is based upon a find at Borum-Eschol, Denmark, which consisted of a coffin made of a hollow oaken log, in which there was a woman's body, with the garments, and some of the flesh, preserved in the peat, in which the burial had been made. Several other similar finds, of both men and women, have been made from time to time, and we are now well informed concerning almost every detail of the costumes worn by both sexes at that remote epoch. (After S. Müller.)

some exactness to subdivide the Age of Bronze into periods, and give them definite dates. The entire Bronze Age may thus be included between about 3000 B.C.

and 1000 B. C., divided into three periods of constant development, as follows:¹

Early Bronze Age	2800-2200 B. C.
Middle Bronze Age	2200-1700 B. C.
Late Bronze Age	1700-1200 B. C.

These dates must be modified a little in applying them to the different countries, as a country like Greece, lying nearer the source of copper, would be earlier supplied with that metal than would the remoter districts of Scandinavia and England; yet each phase of bronze culture seems to have become practically universal in turn, undoubtedly through the commercial enterprise of foreign merchants. Of these, the ones who first brought the copper to the mainland of Europe were undoubtedly the Cretans, who at the beginning of their activity conveyed it to the nearest land (Phœnicia), but soon found their way to Greece, where first on European soil the Bronze Age culture became established. There were some who, emboldened by their success thus far, pushed their way still farther, and opened up the earliest trade routes through the country, yet at the beginning of written history we find Phœnicians, and not Cretans, in control of European commerce.

A rapid change from one to the other at about the end of the Bronze Period is curiously indicated by the sudden introduction at this time of the Phœnician system of

¹ These are the dates given for Crete by Charles W. and Harriet Boyd Hawes (1909). For central Europe the periods should all be somewhat later. Forrer takes an extreme view, and advances the Neolithic to 2100 B. C. "Breasted places Egyptian copper beyond 3400 B. C., iron beyond 2475 B. C., with bronze coming in at a somewhat later date."—N. S. Nelson.

weights and measures, as indicated not only by the actual weights of rings and bracelets of this period which correspond to exact fractional parts of the Phœnician *mina* and *shekel*, but by the discovery of real Phœnician weights.¹ And it is with the coming of the Phœnician merchants that two new substances appear, *glass*

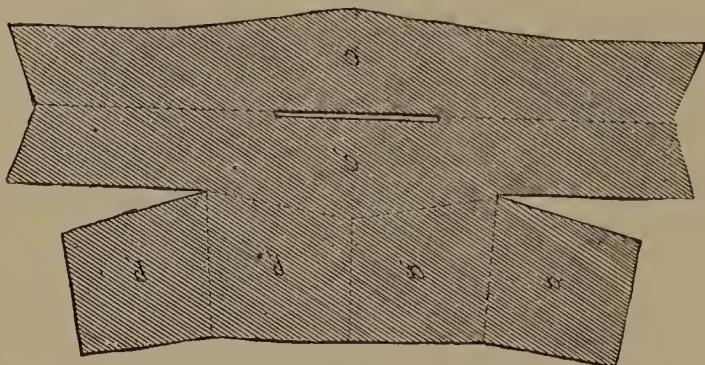


Fig. 60.—Pattern of the woman's jacket found at Borum-Eshol, Denmark. Early Bronze Age. The long slit is for the head. The two lower wings are brought together to form the front, and were fastened together by studs. The upper flap is also folded over to cover the upper part of the chest in front, and meets the lower part, to which it is fastened. The outer wings of the upper piece are sewed together, and form the sleeves, which reach to the elbows. (After S. Müller.)

and *iron*. For a time these seem to have been very rare and precious, for they were used wholly for ornament—the glass for personal decoration and the iron for the adornment of sword hilts, heavy bracelets and other valuable bronze implements. It appears in the Homeric poems (*σίδηρος*) as an article of great value, and of rare occurrence; while the common metal, of which implements and weapons of all sorts were made, was

¹ Forrer (*loc. sit.*), p. 364, instances a Phœnician *mina* of lead, found in the lake station of Wollishofen. Other weights from lake dwellings are based upon the Cretan system.

bronze ($\chiαλκός$). Small pieces of iron were given as prizes to victors,¹ and iron is spoken of as being worked with much toil ($\piολύχμητος$).² During the period of the early Jewish kings as recorded in the Old Testament, the use of bronze (in the King James version translated "brass") was practically universal, while iron appeared only rarely, and then for special purposes. In the temple of Solomon all the metal furnishings of the altar, not of gold, were of bronze, which an imported workman, named Hiram, cast "in the clay ground between Succoth and Zarethan,"³ but iron tools are mentioned in describing the construction of the Temple itself. The colossal image of Nebuchadnezzar's dream was mainly of gold and bronze, with legs of iron.⁴ The coming of the Iron Age was gradual, and in those countries of which we possess an early literature, these beginnings are placed on record.

53. *The Early Iron Age; the Hallstatt and La Tene Periods.*—As far as concerns Europe, it is only in Greece that we possess written records of the introduction of iron, and these occur within the dimness of legends rather than in the true light of history; elsewhere we must still rely upon excavation, as with the earlier periods.

Objects illustrative of the early Iron Age are widely distributed over Europe, generally associated with objects characteristic of the late Bronze Period, and represent a transition period between the two. Thus a few

¹ Iliad, XXIII, ll. 261-850. Cf. Seymour, "Life in the Homeric Age," Macmillan.

² Iliad, VI, p. 48; Od. XXI, p. 10.

³ I Kings, vii. 46.

⁴ Daniel, ii. 32-34.

implements of iron occur in certain of the later Swiss lake dwelling sites, and in a few of the Italian *terremare*, but they are common in the crannogs of Ireland and Scotland, which were inhabited at a much later date than the former. The entire region about the head of



Fig. 61.—Bronze war-trumpet, or "lure," from the late Bronze Age of Scandinavia. These are found with comparative frequency in the moors and peat-bogs, usually in pairs, which when blown, sound in unison. A pair of these was used recently, and played an ancient Scandinavian war march at a Congress of Archeology. (After S. Müller.)

the Adriatic Sea, extending up through Carinthia and Tyrol, as well as down along the eastern coast, is especially rich in early iron sites.

From this abundance of material two characteristic sites, in which the deposits are typical and very abundant, have been especially selected to mark definite periods, *Hallstatt* and *La Tène*. The first of these periods is, locally at least, wholly prehistoric, and marks a transition, in which bronze is still extensively used along with iron; in the second the replacement is practically complete, and the deposits occasionally contain also objects of Roman or Celtic origin.

The Hallstatt site is a narrow glen in the Nôric Alps, about an hour's walk from the village of Hallstatt, on the Hallstätter See. Here, in 1846, an ancient necropolis was discovered and excavated, the first of the work being done by Ramsauer, and continued by van Sacken. In all, 993 tombs were excavated, of which 533 were interments, while the remainder had been incinerated.

Other important sites of the same culture, and evidently contemporaneous in their activity, are those of Watsch, St. Margarethen, near Laibach, and Sta. Lucia, near Tolmino, all in Carniola, Carinthia, and Upper Austria. The classic description of the type locality is by von Sacken, "Das Grabfeld von Hallstatt in Oberoesterreich, und dessen Alterthümer." Wien, 1868, 4, 26 Pls. The objects found in all these Hallstatt Period deposits are rich in numbers and variety, and include both bronze and iron, the former much predominating. Similar objects occur in places over a wide surrounding area, including the Tyrol and northern and central Italy, and record an extensive civilization, of which absolutely no

record is to be found in history, although certain of the historic peoples, like Greece, perhaps, and Crete and Egypt certainly, must have been contemporaneous. Like Horace's "kings before Agamemnon, unwept for and unknown," they "became lost in the obscurity of a long night because they lacked an inspired bard."

But, although as yet neither a scrap of writing nor an inscription of any sort has been found, these people

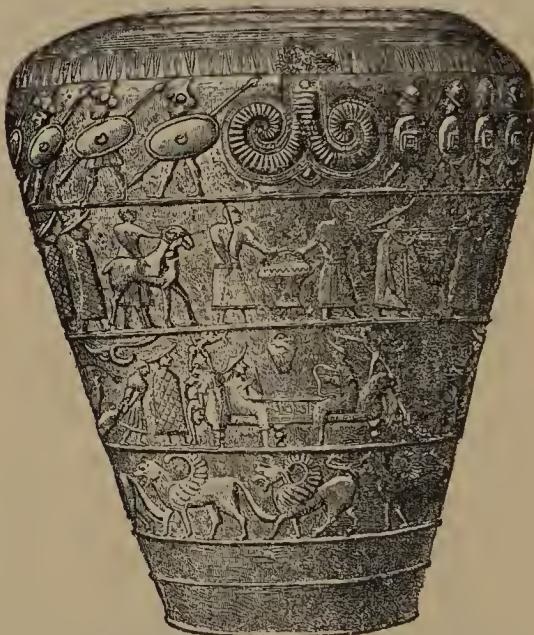


Fig. 62.—Bronze situla of the Hallstatt Period; found at the Certosa, Bologna, Italy. (After S. Müller.)

have yet left a curious pictorial record of themselves, executed in *repoussé* work upon a certain type of bronze object, characteristic of the period. These objects are the *situlae*, a sort of pail with a handle, used perhaps for conveying wine at banquets. They are in large part

plain, or decorated by a succession of ribs running around them, but in others clear zones are left, which bear intricate patterns. In a few cases this clear zone bears, instead of a conventional pattern, outline pictures of the daily life of the people, executed with curious proportions, and bordering on the grotesque, but with a faithfulness to detail which furnishes much direct evidence concerning the conditions of the times. These

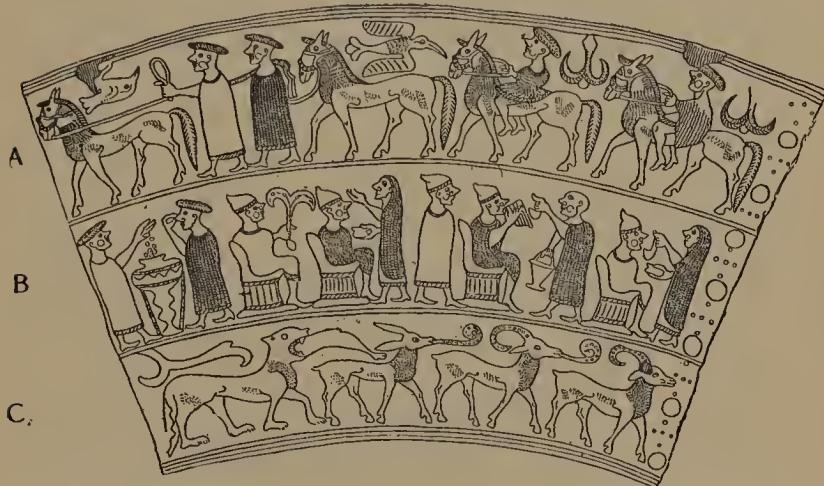


Fig. 63.—Design taken from a bronze situla of the Hallstatt Period found at Watsch in the Tyrol. (After Forrer.)

figures are usually in the form of processions, in which walk stately individuals with flat or pointed caps, and with long, straight garments, reaching from neck to feet, and provided with sleeves. The horse, too, frequently appears, either ridden or harnessed to a chariot or wagon. The charioteers skillfully direct the horses, while a great personage stands by his side; in one case a man in a two-wheeled carriage, beautifully ornamented, is doing the driving himself, and has his wife with him. In another

ease peculiar utensils are being administered to person-ages seated in ehairs, and in one of these a hatless man earries a situla in his right hand, and offers something in his left to a seated person. A eonstantly reeurring pieture is that of pairs of naked boxers, with objeets on their hands like our dumbbells, and attended by men with long eloaks, who eome in from eah side, appa-ently referees. From this it has been inferred that these pietorial situlæ were used as prizes to the vietors in contests similar to those portrayed upon them, but this is, of course, nothing but surmise. The oeeasional pres-ence of a helmet and shield, plaed in the form of a trophy between the two eontestants, suggests a more serious motive than that of simply an athleetic sport. Still other situlæ pieture spirited trains of fighting men in two-horse ehariots, or long lines of foot soldiers with either oval or eireular shields, and earrying spears with points direeted downward; still again, women with mantles and skirts earry heavy burdens upon their heads, and men, aeeompanied by dogs, bear the eareass of a goat or deer, strapped to a pole, the ends of which they rest upon their shoulders. Grotesque animals ap-pear, also in proeession, often with long eurly tongues extended, and with birds perched upon their baeks. In short, the available spaee of such situlæ is erowded with designs like those mentioned, and filled with suggestion to the prehistorian.

The site of La Tène, which gives its name to a period considerably later than that of Hallstatt, is very differ-ent in eharaeter, having been a military stronghold, and not a neeropolis. This site is situated at the extreme northeastern end of Lake Neuehatel, in Switzerland, at

the very outlet of the lake, at a point which for many centuries had been covered by a few feet of water, and called by the fishermen "La Tène" (the shallows). Extensive engineering work, completed in 1876, the "Correction des eaux du Jura," drained this end of the lake and converted the shallows into dry ground.

The remains found here give evidence of extensive pile structures, a military station, and a battlefield, which put an end to the settlement, and, notwithstanding the extensive remains of early pile villages scattered along



Fig. 64.—View of the shallows of Lake Neuchâtel; site of La Tène.
(After Forrer.)

the shores of the same lake, and even near this very spot, it soon became clear that the especial station of the shallows had nothing whatever to do with them. These latter are, like the lake dwellings all over the Alpine countries, Neolithic or Bronze Age in date, while the implements from La Tène are, with very few exceptions, of iron, together with objects of glass and other materials associated with the Iron Age. Most definite of all are the coins, of Celtic and Roman workmanship, found under conditions which preclude later intrusion.

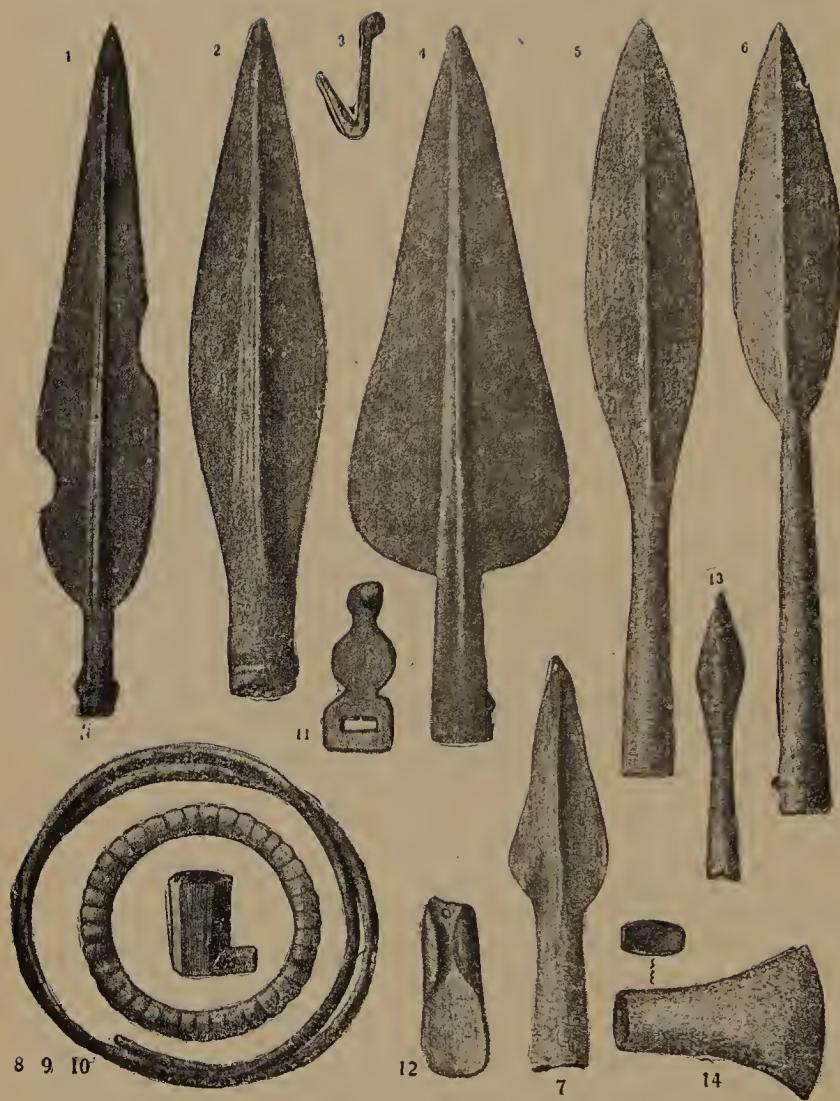


Fig. 65.—Iron lance-heads, axes, and other weapons and ornaments from La Tene. (After Forrer.)

There is thus no doubt that the station at La Tène was a military one, guarding the outlet of the lake, and that it came to its end suddenly, as the result of a successful attack. The probable battlefield was strewed with unsheathed swords, bridle bits and chariot-wheels, and there have been found there the bones of thirty to forty men, some of the skulls showing sword gashes across the top. The station was undoubtedly erected and maintained by the Helvetians, to guard the approaches in that direction, and "the discovery of Roman remains, such as coins, tiles, pottery, bricks (one with the mark of the 21st legion, 'Rapax') on and around La Tène, leave little doubt that its conquerors were the Romans."¹

54. *The Transition from Prehistory to History.*—Certain characteristics of the life at Hallstatt, as depicted on the *situlæ*, remind us forcibly of the Homeric Age in Greece, and although there is not the slightest trace of intercommunication between them, they may well have been contemporary, or nearly so. In La Tène, however, a few centuries after, come the clash of Roman arms and the waving standards of Roman legions, and from this time on the entire continent becomes lighted by the torch of history. Perhaps the times recorded in the late Bronze and early Iron Ages especially in Austria, are those during which the Germanic nations were engaged in their early wanderings, and already assembling to the north of the Danube, from which they were later to throw themselves upon Rome. It is certain that in dealing with these later periods we are investigating the activities of peoples contemporaneous with the early

¹ Robert Munro, "The Lake Dwellings of Europe," 1890, p. 298.

historical periods of Greece, and probably Rome also, and that they are thus prehistoric only in the sense that they have left no written records themselves, and that



Fig. 66.—Implements, mainly of reindeer horn, from the early Iron Age station of Kjelminsel, Norway, now in the museum at Christiana. One third natural size. (After Solberg, in *Praehistorische Zeitschrift*.)

no one with the knowledge of writing had ever traveled among them.

Thus, beginning with the earliest records of human or semi-human activities, marked upon the sensitive sur-

faees of pieces of flint, through the times of the Great Ice, and during the millennia since its retreat, Europe has had a continuous human history, confused no doubt many a time by incursions from the neighboring continents, and by the more or less complete effacement of one race by another over vast areas.

“The prehistory of Europe sounds at first like the murmurs of the primeval forest; deep darkness, relieved here and there by spots of dim light, along the margins of which are thrown the shadows of strange animal forms. Apes play among the tree-tops, and we see, behind a fleeing drove of wild cattle, the pursuing hunter, known only in outline—the First Man.

“But the picture changes; the forest becomes a steppe. In the background gleam the white glaciers. Over the long stretches of steppe grass droves of mighty mammoths are stampeding; herds of buffaloes, too, and wild horses. Nearer the glaciers reindeer are browsing. And behind all these lurks Man, now a troglodyte, seeking the chance of a lucky spearthrust.

“Again the picture changes; mammoth and reindeer have vanished. Packs of dogs run through the wood, through the vistas of which we catch glimpses of mountain lakes, with the fishermen from the lake villages throwing their nets. Sheep and goats are grazing upon the open meadows, and in the distance stretch the fallow fields of the first agriculturists.

“Then this, too, is effaced. Strange merchants bring gleaming metals; ruddy copper and yellow bronze. They hold up before the astonished eyes of the natives gleaming gold and particolored glass; and hard after glass, comes iron. We see the arts, the technical crafts, continually increase. Mighty walls and temples arise, we hear the Celtic war-cry; then the tramp of Roman legions. Cæsar, Tacitus, send us their message—prehistorv becomes merged into history.”¹

¹ Robert Forrer (*loc. cit.*) ; p. 1.

CHAPTER IV

PREHISTORY OF AFRICA, ASIA AND THE OCEANIC ISLANDS

Relation of Europe to Asia and Africa—Prehistory of Africa—Remains of Cyclopean Masonry in Mashonaland—Prehistory of Asia.

55. *Relation of Europe to Asia and Africa.*—It is only for geographical convenience that Europe can be spoken of as a continent. Between it and Asia the boundary wall is less high and less formidable than that which separates western North America from the Mississippi Basin, and the sea which divides it from Africa is not only of recent appearance, geologically speaking, but is nearly spanned by three long peninsulas, reinforced in part by large islands to serve as stepping stones. For these reasons Europe has not been left to develop its human history by itself, but has been constantly modified by migrations from the neighboring continents. As far back as may be followed by written documents and sculptured monuments, Europe has been isolated for scarcely a moment, but has been the scene of almost continuous invasion, sometimes in the form of more or less organized armies or military conquests, but more often as the gradual encroachment of a whole people, a tribal migration.

In its permanent physical effects upon the population, the influence of a military expedition is usually slight, even though its success is complete, and the conquerors

succeed in imposing their language and customs upon the conquered race; for here the invaders consist wholly of males, and their numbers are generally much less than those of the people whom they subdue. In many cases, too, like the Huns,¹ their stay is temporary, and they leave few traces of themselves save a trail of pillage and carnage which a comparatively short time will efface. A tribal migration, on the other hand, where the warriors bring with them their wives and families and where the advance consists of a slow and steady pressure in a given direction, the previous inhabitants will give way before them and eventually become either absorbed into or replaced by the invading race.

Thus the invasion of Italy by Hannibal left practically no Punic strain among the people of that peninsula; the furious onslaught of the Huns passed like a fiery scourge over Europe, but left neither straight black hair nor slanting eyes to mark its passage; and even the long Roman military command of Britain left few traces written in the physiognomy of the British people. Far different were such invasions as that of the Ostrogoths into the Po valley, or the Beni Israel into Canaan. Of the journey of Theodoric "the emphatic language of contemporaries justifies us in saying that it was pre-eminently a *nation*, in all its strength and all its helplessness, that accompanied him. His own family,

¹ Jornandes, in speaking of the Huns, during their great invasion of Europe in the middle of the fifth century, says: "They are little in stature, but lithe and active in their motions, and especially skilled in riding; broad-shouldered, good at the use of bow and arrows; with sinewy necks, and always holding their heads high in their pride. To sum up, these beings under the form of man hide the fierce nature of the beast."

Cited from Hodgkins, "Italy and Her Invaders," vol. i, p. 244.

mother, sisters, nephews, evidently were with him. . . . As with the chief, so with the people. Procopius says, 'With Theodoric went the people of the Goths, putting their wives and children, and as much of their furniture as they could take with them, into their wagons.' '¹

The children of Israel present another type of tribal migration, since their state of civilization had been for a long time a nomadic one, and thus their migration differed little from their customary mode of life. It became a definite plan at first only in the minds of their leaders; and the goal of their wanderings, and the purpose of driving out or killing the previous inhabitants, developed through their direction and at their instigation. On leaving Egypt this people "journeyed from Rameses to Succoth, about six hundred thousand on foot, that were men, besides children. And a mixed multitude went up also with them; and flocks, and herds, even very much cattle."² The subsequent history of the conquest of Israel over the Canaanites, especially the account of their wholesale massacre of these previous occupants, could have but one outcome, and that of a complete ethnic replacement in that region, more complete, in fact, than that of the Indians of New England by the English Puritans, who avowedly took as a model this very tribe.

While, now, great military expeditions, with their profound influence upon political and social conditions, and their insignificant one upon ethnological characteristics, are essentially a modern phenomenon, since they depend

¹ Trans. by Hodgkins, "Italy and Her Invaders," vol. iii, pp. 180-181.

² Exodus, xiii, 37, 38.

so largely upon extraneous means of transportation, a slow tribal migration demands nothing which could not be met by people in the most primitive condition. It is thus natural to suppose, especially as the curtain of recorded history rises upon a world already turbulent and uneasy, a world of constant change of equilibrium through invasion and conquest and tribal movement, that the same conditions extended far back into the unknown past, and even that the first recorded deeds of this character were merely the continuation of an unrecorded series, vastly longer than that of which we have information. The extensive steppes north of the Caspian Sea, where the Ural chain softens down into a succession of low hills, or disappears altogether amid lowlands and marshes, offer to an Asiatic horde, traveling on foot, and advancing by slow stages, an open gateway into Europe, while for a race that has knowledge of even the crudest sort of navigation the Danube, reached from the Black Sea, offers an easy road into the very heart of the continent. From Africa the way to Asia is plain, through Suez and the peninsula of Sinai; by the aid of primitive boats Sicily, Crete and Cyprus could be attained and colonized, and from these colonies the mainland of Europe could be reached at several points. At Gibraltar the two lands are almost in contact.

In view of purely geographical conditions, it is *a priori* impossible for a European population to have developed in anything like isolation: rather have various ethnic strains been intermingled here, probably from both Asia and Africa, and have produced the diversified peoples of present-day Europe. While there is still much disagreement among the ethnologists concerning

the original ingredients of this mixture, a broadly recognized theory considers that the vivacious, long-skulled, brunette people of southern Europe were immigrants from North Africa, and that still further north they have everywhere come in contact with a short-headed race of Asiatic invaders, who extend in a broad belt, at



Fig. 67.—Arrow and lance-heads from the Eastern Sahara.
(After Noel in *L'Anthropologie*.)

about the level of Switzerland, entirely across the continent to the coast of the Atlantic; yet, even granting this, who may presume to say that these shadowy migrations were the first in this region, or that the strains thus introduced were themselves of pure stock and homogeneous?

56. *Prehistory of Afriea.*—It is thus of the greatest importance that the prehistorian now turns to the two continents closely associated with Europe; Asia and Afriea, for it is to these lands we are to look for the origin of the peoples who first populated Europe, and probably also for the origin of the human race itself. When, about the middle of the nineteenth century, the work of Boucher de Perthes upon the paleoliths of the Somme valley began to bear fruit, and stone implements from various parts of Europe, at first mainly Scandinavia and France, began to fill the museums, similar objects were brought to light in the neighboring continents, especially in places where, as in Egypt and Syria, excavations were being conducted for other purposes. In Africa genuine paleoliths were first found in the Nile valley, deep in the soil upturned in the excavation of Egyptian antiquities, often, indeed, beneath the foundations of ancient Egyptian buildings themselves, pointing to the occupation of the valley of the Nile ages before this first historical dynasty. Thus true paleoliths of flint were found by Areelin in 1869 at Sakkara and Gizeh, among the great pyramids and by Hamy and Lenormant at Thebes in the same year. From then on paleoliths were reported, with ever increasing frequency, from various quarters along the same valley. Zittel pushed his investigation into the depths of the Libyan desert, far from present-day oases, and found paleoliths there also, proving beyond question the former fertility of that region, and its occupation at one time by man. From these earlier reports, during the 70's and 80's of the previous century, the discoveries have progressively multiplied, until now the area of distribution of paleo-

liths in Africa has widely extended, and includes, besides the Nile valley, the western Sudan, especially around Timbuctoo, and the valley of the lower Congo. The study is still in the stage of the collection of ma-



Fig. 68.—Polished axes of the Neolithic type from the Eastern Sahara. (After Noel, in *L'Anthropologie*.)

terial, however, and the data are insufficient for attempting to reconstruct any outline of African prehistory.

A certain type of megalithic monument, the menhir, or single stone column of vast proportions, occurs scattered across the northern portions of the continent. These, on the one hand, are continued through Morocco,

to Spain, and thence directly to France, where in Brittany such structures come to a high state of development; while proceeding eastwards to Egypt, they are shown in finished form in the obelisk. These structures are for the most part late Neolithic, or possibly early Bronze, in date, and their occurrence over this broad area, and across the Straits of Gibraltar, suggests a kinship in origin and indicates, perhaps, the migration of a prehistoric people across northern Africa and up through western Europe; or perhaps only the conquest and gradual spread of power and influence from a small center over alien races.

57. *Remains of Cyclopean Masonry in Mashonaland.* Interest has always been attached to possible archeological discoveries in those parts of central and southern Africa that so long resisted exploration, and from time to time reports have been spread concerning remarkable ruins somewhere in those parts, of which the local tribes can give no information. Such are the ruined walls of Cyclopean masonry at Zimbabwe, Mashonaland, and similar structures have been brought to light in other parts of the same general region. While at the present time little can be postulated concerning all such ruins, since many of them have not only never been excavated, but have not even been carefully described, it is well to bear in mind that no reliance can be placed upon the native traditions or memory, as "no native appears to know anything of the past, unless that past happens to have been within his own personal recollection."¹ It is also to be noted that a neglected building or wall of masonry,

¹ E. M. Andrews, "The 'Webster' Ruin in Southern Rhodesia," in *Smithsonian Quarterly*, No. 4, 1907-8, p. 37.

abandoned in a tropical jungle, becomes soon overgrown with vegetation, and takes on the appearance of extreme age.

The recent excavation of the small "Webster" ruin in southern Rhodesia is of much interest as a typical illustration of this, since the examination failed to prove an antiquity of more than two centuries, although it was not learned what the structure was, or the reason for



Fig. 69.—The "Webster Ruin" in Southern Rhodesia. (After Andrews.)

its construction. This ruin, discovered by white men in 1892, consists of a nearly circular wall, built in two tiers. The diameter on the ground is about fifty feet, and the height of the first tier nine feet. The second tier is set in at about the same distance as the height of the first tier, and rises upward of four feet above the other. At one side is left a gap for the door, beside which, and

upon the inner tier, there is a little extra structure, three feet in height, capped by a flat stone. The stones of which the structure is composed are rather flat, and average about thirty pounds each in weight. They are laid in irregular courses, and are without mortar, but are in places reinforced with earth, which was probably their condition throughout. Outside of this ruin or "temple" were several stone slabs set nearly erect in the ground, as though marking graves, and upon another side were small stone heaps, also thought to be graves.

About a mile to the north of this ruin, near the present kraal of Chief Ichickwanda, is found another similar structure, though somewhat smaller, the walls enclosing a room with a diameter of twelve feet, and seven feet in height. This ruin is better built than the previous one, and the stones used are not only much larger, but show some attempt at having been dressed into shape. Around this structure are four smaller and cruder enclosures.

In spite of the promising appearance of both of these sites, a thorough excavation of the former, made by Mr. E. M. Andrews in 1906, was barren of results. No human bones were found, even in the "graves," but the disturbed earth was filled with bones of the antelope, shards of native manufacture, iron spear heads and other implements, and in one or two places small bits of green glass and even smaller fragments of bowls of Nankin china. The glass can be traced to the jars used by the neighboring Portuguese for wine, and the china may easily have come from the same source. From the evidence presented, the excavator was convinced that the ruin "cannot be earlier than the end of the six-

teenth century, and is probably later. It was undoubtedly built by the present natives, or some allied tribe, either for defense, or more probably as a cemetery, for the disposal of their dead." This instance is cited at length, not as a contribution to prehistory, which, in the usual sense, it is not, but for the purpose of emphasizing the two points previously mentioned: the short memory of the natives, and the rapidity with which, in a tropical country, an abandoned structure assumes the appearance of extreme age. As a result of the first, there is practically no true history in any portion of central or southern Africa, save that of the past two hundred years, since the settlement of that region by white people. Before this time, recent as it is, all is prehistory in the sense that it is unrecorded. As with America, the discovery of which but slightly antedated that of the region in question, little can be obtained from tradition, something may be learned through the study of the various tribal languages and the physical features, but the main reliance must be placed upon excavation, for the records held in the soil are for the most part permanently preserved, and—if the work is carefully done—chronologically dated, and cannot fail to give correct clues when properly read. It is idle to speculate concerning what may be in store for us in the future in this regard, yet we may be confident that eventually the entire history of man upon this continent will be traced as elsewhere, through the results of his activities and the occasional chance preservation of his bones.

58. *Prehistory of Asia.*—Although still practically unknown in its prehistory, the continent of Asia holds,

without much doubt, the essential data for the study of the last phases in the development of the human race. It is true that the soil of Europe has yielded, in chronological succession, a series of forms gradually approaching the present type, but it is also true that there is yet no indication of a European origin for any of these, and they are generally looked upon as successive migrants from elsewhere, either Asia or Africa. Again, the *Pithecanthropus*, almost, if not quite, a direct transition form between Simians and man, was found in the island of Java, closely associated with eastern Asia, and while in itself not wholly conclusive, is yet a marked indication that the origin of the race was Asiatic.

When Asiatic prehistory is finally studied, it will possess an advantage over that of Europe in the ancient date reached by actual written inscriptions, since they will prove of the greatest value in dating contemporary remains elsewhere, whatever grade of culture they may represent. In other words, in this continent, where recorded history dates back six or seven millennia, a quantity of data will be eliminated from the problem presented to the prehistorian, who will thus be enabled to deal wholly with periods not merely relatively ancient, but actually so.

During the past few years a beginning has been made in this more ancient Asiatic history by the discovery of many types of stone implements in various parts of that great continent. In Syria, at first about the Lebanon range and in Palestine, and later in the north, stone implements were found, representing both Paleolithic and Neolithic culture, while in that country the

Bronze age is known to have extended between about 2000-1250 B. C., and ended with the advent of the Philistines, who introduced iron.

Still, the form or style of an implement does not necessarily prove for it great antiquity, since a crude implement may often be used for a bit of rough work rather more effectively and with more economy than

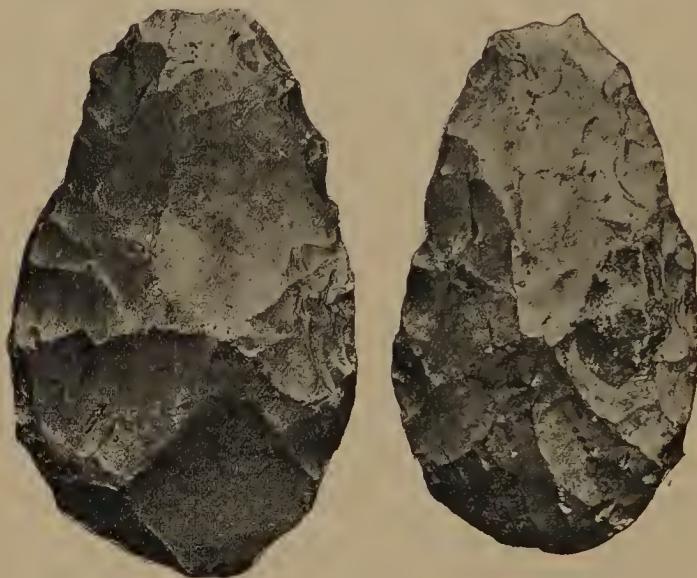


Fig. 70.—Flint axes of Acheulian type, from the North of Syria.
(After Arne, in *L'Anthropologie*.)

a better one. Thus, in the ancient turquoise mines on the peninsula of Sinai, worked by the Egyptian kings from Snefru, B. C. 3122, to Rameses II, B. C. 1326, are found the crudest type of stone axes, resembling the *coups-de-poing* of the European Chellean period, yet these were undoubtedly in common use during these comparatively recent times.

Aside from the extreme west the discovery of stone implements has been reported from the island of Ceylon, from Tonkin, the French colony in China, and from Japan. The prehistoric studies in Ceylon¹ were made in cave deposits, and consist of Paleolithic instruments of about the Magdalenian type, evidently made and used by a small human race, of about the size of the present Veddahs, although the discoverers feel sure that the latter could have had no connection with these deposits, which are undoubtedly of great age. On the other hand, implements of the early Paleolithic, as well as of the Neolithic and Bronze ages, are as yet unknown in the island, although axes of the Chellean type occur on the adjacent continent.

The investigation in Tonkin² was that of a cavern deposit 75 kilometers north of Lang-Son, and consisted of flint and bone implements of a crude Neolithic culture, together with one or two pieces of shell ornaments and a little pottery. The absence of animal bones and the presence of many shells of *Unio*, etc., suggest that the people were not hunters, but subsisted largely upon vegetables and mollusks.

In Japan the study of prehistory has already been prosecuted to a considerable extent, with the result of finding many traces of the previous existence of a stone-age culture in many parts of the Japanese islands. The remains consist of extensive kitchen-middens, and of traces of semi-subterranean houses, both associated with

¹ P. Sarasin, "Prähistorische Ergebnisse unserer neusten Reise im Inneren von Ceylon." *Korresp. Bl. d. deutsch. Ges. für Anthropol.* Bd. 38, 1907, p. 94.

² Mansuy, M. H., "Gisement préhistorique de la grotte de Pho-Binh-Gia (Tonkin)." *L'Anthropologie*, T. 20, 1909, p. 531.

plentiful artifacts. Thus far these remains seem to indicate the former presence of two distinct races, the one, limited to the Ryu Kyu islands and Formosa, the other upon the two largest of the main islands, Yezo and Nippon. The first race was without stone arrow-heads, and its pottery never possesses a trace of textile upon its surface; the second had arrow-heads of stone, as well as those of wood, bone, and horn, and its remains yield also clay figurines. Some authorities do not consider either race to have been the direct ancestors of the Ainu, but think that they represent pre-Ainu peoples, probably the "Koropokguru" of the old Ainu legends, and that they migrated northwards at the coming of the Ainu. Others consider the Koropokguru as wholly imaginary, think that the Ainu were themselves the real aborigines, and look to find traces of their ancestors among these early remains. The culture of these prehistoric peoples was Neolithic, but their pottery seems unlike that of the Ainu of the present day.¹

Such fragmentary notes of isolated discoveries are thus far all that can be presented under the head of the prehistory of Asia, but it must be remembered that sixty years ago the study of European prehistory was equally fragmentary, and with the facts uncoördinated and apparently unrelated. The discoveries thus far made tend to stimulate interest in this work, and emphasize the statement made above concerning the great importance of Asia in this regard.

¹ For a recent summary of the work of Japanese archeologists, cf. Matsumoto on "The Stone Age People of Japan," in *Amer. Anthropologist*, Vol. 23, 1921, pp. 50-76.

In various parts of Oceanica occur ruins which look ancient, and which the present natives do not connect with the former history of their own race. Both this shortsightedness of anything which antedates the memory of living men, and the ancient appearance of ruins which are recent, form the standpoint of an archeologist, are well known elsewhere; the former among primitive people everywhere, and the latter in the tropics, where recently abandoned ruins are left to the mercy of luxurious tropical vegetation, and thus these Oceanic ruins, although by no means solved, are not necessarily very ancient. There may be mentioned in this connection, the cyclopean walls met with in the Carolines, and more especially the stone statues found in Easter Island. This island, the easternmost of the South Sea group, is within about two thousand miles of the South American coast, and belongs to Chile, used mainly as a pasturage for sheep. The island is volcanic, and is covered with statues carved from the lava of a certain mountain, set with their backs to the sea, and similar to one another in shape. They number about two hundred, besides almost numberless ones, in process of being carved in place, and evidently destined to be carried away from the bed rock, and set in place. They range in size from six feet up to thirty, and one of the uncompleted ones still on the mountain is sixty feet high. Some have suggested that these huge ones were never intended to be moved, but were intended for high reliefs to permanently adorn the cliffs. The isolated figures were placed upon high foundations of masonry, but were all overthrown during a tribal war about the beginning of the nineteenth century, and now lie on their backs. They are .

pleasantly and minutely described in a book by Mrs. Scoresby Routledge, about 1920, and form the subject of an illustrated article by her in the *National Geographic Magazine*, January, 1921.

CHAPTER V

PREHISTORY OF THE TWO AMERICAS

The Problem of a “New World”—Supposed Remains of Glacial Man in North America—Claims concerning Pre-Indian Remains in South America—American Stone Implements—American Articles of Bone, Shell, and Similar Materials—American Metal Work—American Basketry and Weaving—American Pottery—Classification of American Aboriginal Objects—American Architecture; Single Dwellings and Community Houses—American Architecture: Remains of Temples and Temple-Cities—American Graves—Mounds, Funereal and Commemorative—American Petroglyphs and Other Forms of Writing—Central American Glyphs and Codices—Possible Connection between the Civilizations of the Eastern and Western Worlds.

59. *The Problem of a “New World.”*—To undertake the study of the prehistory of the two Americas is to engage in a problem for which no foundation stone has been laid for us; a field of research unconnected with the course of recorded history save within the past four centuries. This vast double continent, although occupying an entire side of the globe, has, until this brief space of time, existed as a world apart, and the learning of Greece, Rome, Arabia, and later Europe left no place for it within their treasure-houses of accumulated knowledge. When however, this continent, literally a “New World” as it was well called, was first discovered and then explored by Europeans, it was found to be everywhere inhabited, from the icy fields of the far north, through both temperate zones and the

intervening torrid area, even to the extreme southern land of fire, the *tierra del fuego*.

Ranging in culture throughout the various phases of the Neolithic, from the erudest to the most superior, passing even beyond its bounds in a few favorable regions, where hardened copper took the place of the more typical bronze, the inhabitants are of a single ethnical type. Although varying in complexion, the most superficial of somatic characters, from a light skin, approaching that of the European, to a deep brown like that of many negroes; varying also quite as much in costume, in house building, in foods, and in industries; unlike in language, and even in the word roots employed for the commonest conceptions; they are yet of *one homogeneous race*. Everywhere the straight black hair, low and often slanting foreheads, with high cheek bones placed far apart, large noses of medium breadth and well accentuated, mark them as members of that race which, by an unfortunate mistake of the first explorers, has become universally known as "Indian."

From this sweeping conclusion, however, the Eskimo may be excepted, and these little Arctic men are perhaps better considered as late wanderers from the camps of similar Arctic peoples of northeastern Siberia, who could easily have spread across Behring Strait to their present location. Yet if the true "Indians" populated America from northeastern Asia in the first place, as seems likely, there can be no profound racial difference between them.

This assertion of the ethnical homogeneity of the American Indians does not necessarily bring with it

the corollary that such was always the case, or that the present race were the first and only occupants of the Americas. While the prevailing opinion has long been, and perhaps still is, that the Indians were the first and only comers to the New World previous to its discovery by Europeans, there are those who, independently in the case of the northern and southern continents, maintain the existence of one or more pre-Indian American races, and the assertion has even been stoutly maintained by some that it was upon American soil, rather than in any part of the Old World, that primitive humanity completed the chain of development that ended in the formation of the genus *Homo*. In North America skeleton remains have been found from time to time, in various parts of the country, such as the "Calaveras skull," the "Lansing skull," the "Nebraska man," and so on, for which, because of the antiquity of the deposit in which they were found, or because of certain primitive features in the bones themselves, or because of both, a considerable age has been claimed, usually a Glacial age and a Paleolithic culture; but the most careful investigations of these remains by sober-minded and conservative men have thus far resulted in the failure to prove these claims. Definite proof of geological age is in every case lacking, and the remains themselves show no physical features unlike those of modern Indians.¹

60. *Supposed Remains of Glacial Man in North*

¹ Hrdlicka, "Skeletal Remains Suggesting or Attributed to Early Man in North America." Bureau Am. Ethnol., Bull. No. 53, Washington, 1907. For the other side cf. Gilder, in *American Anthropologist*, 1908, pp. 60-73; also in *Records of the Past*, May-June, 1911.

America.—In one part of the country only are anything like adequate proofs submitted for the existence of a pre-Indian race, or of men of a true Paleolithic culture, and this is in the Delaware valley, in and immediately about the city of Trenton. Here, in 1873, Dr. A. C. Abbott, a resident, discovered in the Trenton gravels, of undoubted Glacial age, an abundance of what appeared to be large paleoliths of simple construction, much like those first found by Boucher-de-Perthes in the gravels of the Somme valley, northern France. The most characteristic was that of the "turtle back," an implement somewhat similar to the *coup-de-poing* of the French gravels, yet other forms were not wanting, and all were found in place, several feet below the surface, in undoubted glacial gravel.

Although Abbott's discoveries convinced several experienced observers during the next two decades, among others N. S. Shaler of Harvard, and W. Boyd-Dawkins, the noted English archeologist, yet still others, like Joseph Leidy, were not convinced of the antiquity of these artifacts, and in 1893 W. H. Holmes of the U. S. Bureau of Ethnology stated definitely that the Trenton implements were merely "wasters" or "objects," cast away by modern Indians whose village sites occupied the surface above the gravel.¹ In holding this opinion it is plainly necessary to reject all proofs that these objects had really been found in place in undisturbed glacial gravel, and, as a matter of fact, the earlier excavations seem to have been conducted with some

¹ W. H. Holmes, "Are There Traces of Man in the Trenton Gravels?" *Journal of Geology*, Vol. I, Jan.-Feb., 1893. Cf. also H. C. Mercer in *Amer. Nat.*, Nov., 1893.

lack of precision, and furnish no positive proof concerning the original position of the objects. The problem had become, as expressed by Mercer, in 1897, "narrowed down to evidence produced at one site, and to a question of observation of individuals."¹

An excellent resume of this Trenton gravel problem is the recently published report of Ernest Volk, in which are embodied the results of his indefatigable labors for twenty-two years in and about the city of Trenton.² In this region he finds both bones and artifacts of three successive human races, which he designates in order, from above downward: (1) The Dweller of the Black Soil. (2) The Dweller of the Yellow Soil. (3) Glacial Man.

The "black soil" is the surface loam, and its "dweller" is the modern Indian, whose plentiful artifacts occur everywhere upon and within this deposit, and who, in his deeper excavations, such as graves, fire-pits, and post-holes, carries the black soil with him, producing intrusions, or disturbances from above, in the subjacent layers.

In contrast with this race, and much older, is the one whose artifacts occur at Trenton in a layer of yellow sand immediately underlying the loam and so closely related to the surrounding matrix that they must have been contemporary with its deposition. The artifacts of this period are limited to crude implements of

¹ H. C. Mercer, "Researches Upon the Antiquity of Man," *Publ. Univ. Penna. Series in Philology, Literature, and Archeology*, Vol. VI, 1897, p. 85.

² Ernest Volk, "The Archeology of the Delaware Valley," *Papers of the Peabody Museum, Cambridge*, Vol. V, Aug., 1911 (the entire volume, 258 pp. and 125 plates).

argillite, and to quarzite pebbles broken by fracturing and by fire. Traces of skeletons of the yellow drift man himself, lying beneath undisturbed layers of stratified sand, show them to have been large and well-built, but the bones have hitherto proved too fragile to allow satisfactory disinterment.¹.¹

Of the man of the true glacial gravels, beneath the yellow drift, Volk obtained but a few doubtful fragments; the middle and upper portion of the shaft of a femur, and three partial fragments which fit together. If we accept Mr. Volk's careful statements concerning their position when found, they must be considered sufficient, few as they are, to prove the existence of man in this valley, contemporaneously with the more recent deposits of the glaciers, but there are reasons for doubt. The femur seemed to have been shaped artificially to form a handle for some implement, and its human origin is not sure. All the fragments were badly ground and worn, as if by the rough treatment to which glacial material is usually subjected. In form, however, the skeletal fragments are not in any way unusual, and may easily have been those of the modern type of Indian, save for the supposed geological relationships of the pieces.²

The latest claim for Quaternary man in North America arises from the discovery of human bones in Vero, on the east coast of Florida, under circumstances which seem to date them well within glacial times.

¹ For the most recent paper on the human remains from the yellow soil, cf. that by Leslie Spier in *Anthrop. Papers of the Amer. Mus. Nat. History*, Vol. 22, New York, 1918.

² Hrdlicka, Report, given as an appendix to the paper of Volk, 1911, above cited.

This find was made in 1916, while digging a drainage canal, and consists of four human skeletons, in close association with the bones of Pleistocene animals, such as the mastodon, the giant ground sloth (*Megatherium*), the bison, and the wild horse. Upon investigation of the spot by O. P. Hay and A. Hrdlicka, the former of the Carnegie Institute at Washington, the latter of the Smithsonian Institution, opinions became divided, Dr. Hay feeling that the human bones were contemporaneous with the associated animal bones; and Dr. Hrdlicka believing them to be not ancient, but the result of intrusive burial at some relatively modern date.¹

This latter fate, that of not being considered ancient, has befallen the "Cuzco man," a product of the Yale expedition to Peru in 1911. This was at first considered to be of "glacial age," by the discoverers, but its claim to antiquity was later disproved by the discoverers themselves.

61. *Claims Concerning Pre-Indian Remains in South America.*—While, up to the present, the northern continent has furnished few signs of human activity before the arrival of the red man, South America has yielded a number of remains upon which claims have been based, as attesting the presence not only of genuine pre-Indian human beings, but of so many and such significant transition forms as to suggest seriously this continent, rather than any part of the Old World, as the land of origin of the human race. These discoveries, which have been

¹ A. Hrdlicka, "Recent Discoveries Attributed to Early Man in America," *Bull. Bureau Amer. Eth.*, No. 66, 1918. The other side is ably supported by Hay, in *Amer. Anthropol.*, Vol. 20, pp. 1-36, 1918.

heralded in rapid succession within the last few years, have naturally not only provoked discussion, but have attracted to South American soil many eminent anthropologists and paleontologists, who have variously estimated the value of the discoveries.¹

This great activity had its focus and point of origin in a single man, the late Dr. Florentino Ameghino of the Museo Nacional, Buenos Aires, who, although ably seconded by other savants, has been the central figure in the movement. Early in the development of this work, perhaps too early for more than a fancy sketch, Ameghino postulated the probable steps in the upward development of man, and embodied this in a phylogenetic tree, unique in character and decidedly unlike those of other anthropologists. In this scheme a succession of small creatures in the Cretaceous period, *Clenialites*, *Pitheculites*, etc., leads up to the "primitive Hominidæ," which, by a process of "bestilization" develop into the anthropomorphic apes of the present day.

Continuing, on the other hand, along a still general-

¹These remains have been for the most part found and described by the late Dr. Florentino Ameghino (d. 1912), whose delineations and theories excited all Europe. Several noted European savants made the journey to Argentina to see the material and the sites, among whom were the geologist Steinmann, who returned unconvinced, and the anthropologist Lehmann-Nitsche, who gave some credence to the finds. The latest, and probably the most important, visit was that of Hrdlicka of the Smithsonian Institution in 1911, who studied both the specimens and the sites in company with Ameghino himself, and with the most favorable opportunities for investigation. As related in detail in his final report (Bureau of Ethnol., Bull. No. 52, 1912), he found nothing to support Ameghino's claims. The bones in all cases proved to be either those of Indians of the present race, or of well-known extinct animals.

ized path, came the successive genera of *Tetraprothomo*, *Triprothomo*, *Diprothomo*, *Prothomo*, and finally *Homo*, while the successive lines of differentiation from these gave rise to such forms as *Pithecanthropus*, and *Pseudohomo heidelbergensis*. At the time this tree was constructed many of the stages, some of which were of fundamental importance, were not known from actual specimens, but certain of these deficiencies were later supplied, in part from new discoveries of Primate material, and in part from remains already stored in the museums of South America, and perhaps wrongly estimated hitherto. Thus an atlas, discovered by Ameghino in 1887, and named by Lehmann-Nitsche *Homo neogaeus*, was brought into line with a curiously shaped femur from the same deposit, the Tertiary of Monte Hermosa, and named *Tetraprothomo argentinus*, thus filling an important blank in the phylogenetic tree. The chance discovery in 1896, during the construction of a drydock in the harbor of Buenos Aires, of the frontal bone of an apparently very low type, filled for Ameghino another gap, and the piece was named *Diprothomo platensis*.¹

Claims so astonishing and revolutionary in character as these naturally aroused not only the attention but also the criticism of the entire scientific world, who, when furnished with the necessary casts and photographs, subjected the entire evidence to a rigid examination.

¹ Ameghino, "Le Diprothomo platensis, un précurseur de l'homme du pliocène inférieur de Buenos Aires." An. del Museo Nacional de Buenos Aires, 1909. For a critical study of the South American finds of Ameghino, which includes the account of a personal investigation of the sites, cf. Bureau Amer. Ethnol. Bull. No. 52, by Hrdlicka and others.



Fig. 71.—Ameghino's "Diprothomo platensis," as restored by him from the debatable fragment. (From Schwalbe, after Ameghino.)



Fig. 72.—Ameghino's "Diprothomo"; the fragment in two positions. In one of these, that indicated by the dotted lines, the fragment is slanted backwards, as was done by Ameghino, and appears as in Fig. 71, representing an extremely low type. In the position indicated by the full lines the same fragment is placed correctly, and becomes quite human, with nothing unusual about it. (After Schwalbe.)

Schwalbe¹ examined the frontal bone from the drydock, the "*Diprothomo platensis*" of Ameghino, and proved beyond question that the bone was in every feature that of the modern species of man, in all probability that of a native Indian, and that the appearance of an extremely low, retreating forehead had been given simply by a wrong orientation of the piece in its relation to the entire head. The ease with which such a mistake may be made will be seen by any student if he will take in his hand a detached frontal portion of a human skull and try to place it in what seems a natural position.

The *Tetraprothomo*, as it consists of two separate bones, an atlas and a femur, still allows several opinions, and as the discovery of the latter is so recent, a comparatively small amount has been written upon it as yet. Lahmann Nitsche² considers the atlas not quite human, but belonging to some precursor whom he names *Homo neogæus* (the man of the New World), but most others (e. g. Schwalbe and Hrdlicka), find in it no essential difference from the corresponding bone in modern South American Indians. Concerning the femur, the criticism is still more severe, since, as Hrdlicka has recently shown, it seems more than likely to be that of a Tertiary member of the *Felidae*, that is, a fossil cat of unknown species.

¹ G. Schwalbe, "Studien zur Morphologie der Südamerikanischen Primatenforen." *Zeits. Morph. u. Anthrop.*, Bd. 13, 1910, pp. 209-288.

² Lehman-Nitsche (in collaboration with others) : "Nouvelles researches sur la formation pampéenne et l'homme fossile de la République Argentine." *Revista del Museo de La Plata, Buenos Aires*, 1907.

Thus, in the light of recent criticism, European and North American, the extravagant claims of South America as the cradle of the human race are becoming rapidly disproved, and with these there fall also the numerous supposed cases of human remains of Quaternary date, such as those of the cave deposits of Lagoa Santa (Minas Geraes, Brazil), those of the Pampean deposits of Buenos Aires, and those of Patagonia. Hrdlicka, in the work just cited (Bulletin 52, 1912), assisted by several other specialists, has reviewed in order each of the more prominent and likely cases, not only studying the original specimens, but visiting also the site of the excavation, and wherever, indeed, the bones are human, they are in no way unlike those of the modern Indian of the region. In all cases, also, the geological conditions are indefinite, and show at least the possibility of a late intrusion of the remains with the deposit in which they were found.

The southern continent, when carefully studied, but corroborates the teaching of the northern, that the native Indian, himself a late comer, geologically speaking, found the entire continent devoid of all human inhabitants, and that, furthermore, with the single possible exception of the Delaware valley, where the testimony is still slight, nothing human had previously either arisen or appeared there. A "New World," as the Americas seemed to the European voyagers of four centuries ago, this twin continent is in a larger sense a new world to the entire human race: a world where the human species was, perhaps, first seen at the time, geologically modern, when the immediate precursors of the Indians first found their way over from the Eastern Hemisphere.

By what route or routes this was accomplished, whether by Behring Strait from northeastern Asia, whether from Polynesia or the coast of Africa in drifting canoes, or whether by some former land bridge now lost beneath the waters, we cannot say, nor have the Indians themselves any traditions that bear upon the problem.

All that can be asserted, and that without too much positiveness, is that, still with the possible exception of the recent finds in the Delaware valley, there is nothing to indicate a long occupancy of American soil by the Indian. His culture in various regions represents about every phase of the Neolithic, as shown in Europe, and in a few places the entrance into an age corresponding to that of the Bronze, but even if all this development was run through after reaching America, which is by no means certain, the time required, as measured by the data furnished by research in Europe, would be but a few thousand years—eight, or ten at most.

The whole subject is, however, still open. The continued study of the Trenton gravel, and of the yellow drift lying between it and the superficial black soil, may yield something certain. The North American claimants to age, like the skulls of Calaveras and Long's Hill, may yet be reinstated in spite of the fact that definite proofs of age are wanting; and it must be kept in mind that even a complete disavowal of claims of extreme age in the case of all South American material hitherto unearthed does not prove that no such specimens may ever be found within that continent. The more conservative view, however, still is that the Indian was a comparatively late arrival, that he found the continent at

the time of his advent entirely unoccupied by human beings, and that we have as yet no absolutely definite records of any previous race who may have occupied a portion of it at an earlier time.¹

62. *American Stone Implements.*—The best known stone implements are the "arrow-heads" or points, which are rather commonly scattered over the country, always upon or near the surface, and are familiar objects to farmers and others engaged in work that disturbs the surface soil. They are also frequent in Indian shell-mounds, about aboriginal village sites, and in

¹ Never, even at the time of the early explorers, were the American Indians spread over the entire country. They lived for the most part in scattered villages, each with its "chief" and leading men, and of these chiefs now one and now another—apparently by the force of his personal character—gained a supremacy, more or less complete, over the surrounding territory. New England, at the time it was decimated by the plague of 1616-18, was thickly settled from the Indians' point of view, yet as counted by such men as Daniel Gookin and Roger Williams, who traveled among the tribes and knew them intimately, the largest villages numbered but a few hundreds each. An Indian population, except in the case of the Pueblo tribes, who inhabit permanent structures, shows a tendency towards a slow shifting or migration, so that in the course of a few centuries the position of important tribes could change considerably. There are, for example, good indications that the Pequots and Mohegans of Connecticut, whom the Colonists found in possession of territories with fairly definite boundaries, had migrated to this part of the country some three to four hundred years before from further northwest, and probably the Niantics, whom they dispossessed, had settled there but a few centuries before them, at the longest. Throughout southern New England the sites of Indian villages and cemeteries, laid bare by the spade, were known as such by the settlers of the seventeenth century, and no really prehistoric sites, unmentioned in the traditions of the white people, have been found. This speaks strongly for the recency of occupation by members of the human race in the region specified, and suggests the gradual spread of the Indians over a virgin country within a measurable time.



Fig. 73.—American aborigines at work in a native quarry workshop. From a group in plaster, prepared by Dr. W. H. Holmes for the World's Columbian Exposition in Chicago in 1893. (After Holmes.)

graves—indeed, in the latter place, often found imbedded in vertebra or the skull, plainly the cause of death.

But aside from chance finds, such objects are more closely associated with the Indians themselves, or with traditions, for not only were the natives equipped with stone-tipped arrows at the time of the discovery, but the use of these and other forms of stone implements has continued in places to the present time. Thus it has been possible as late as the latter part of the nineteenth century to observe directly and describe the aboriginal methods of manufacture of flints and other stone implements, and more than one archeologist has learned to manufacture excellent artifacts, which, in their details such as chipping and retouching, closely resemble those of aboriginal make.¹ This work is laborious and difficult to learn, and Catlin remarks that "great skill was required, and a thorough knowledge of the nature of each stone, a slight difference in quality necessitating a totally different manner of treatment."

Aside from the points there are numerous other types of stone implements made and used by the American aborigines, both within historic times and earlier. These are mainly Neolithic in grade of workmanship, although, as always among Neolithic culture, cruder, roughly fin-

¹ The most important work dealing with aboriginal methods of manufacturing stone implements is W. H. Holmes's "Handbook of Aboriginal American Antiquities," published as Bull. No. 60 of the Bureau of Ethnology, 1916. In an extensive paper on "Stone Implements of the Potomac-Chesapeake Tidewater Province" (Bureau of Eth., Vol. 15, 1893-94), W. H. Holmes describes the technique requisite in the case of many kinds of material, and in Pl. CIII are given some implements of his own manufacture, produced by wholly aboriginal methods.

ished forms, were also in common use for the coarser work.¹

The stone artifacts most commonly met with are the so-called "arrow-heads," which really consist in large part of points used for tipping arrows, but among which, and commonly confused with them, are many other kinds of implements, such as knives, scrapers, borers, and so on. Axes, both grooved and ungrooved, are frequent, as are also chisels and gouges, spades, banner-stones, and the like.² The most of these were originally associated with handles, or other essential parts of wood or leather, so that in their present denuded condition, they give but a slight suggestion of the really effective implements they once were.³ Stone mortars and other stone dishes are rare, but are likely to be met with in any part of North America, often in association with the pestles used in grinding corn. Such pestles were often heavy and were used in association with a

¹ Two recent works, with beautiful illustrations, many of them in the natural colors, are those of W. K. Moorehead, "The Stone Age in North America," 1910, and "Stone Ornaments of the American Indians," 1917. Other works by the same author are also of value. Cf. also papers by Beauchamp in the New York State Bulletins, Vol. 4, Nos. 16 and 18. Shorter papers, with beautiful illustrations, have been published by Perkins in the *American Anthropologist* from time to time, e.g. in Vol. 11, 1909; Vol. 14, 1912.

² For a study of the stone axes and adzes of New England, cf. Willoughby, C. C., in *American Anthropologist*, Vol. 9, 1907, pp. 296-306.

³ In a few rare cases, in which the soil was especially favorable to preservation, the wooden parts have been found in connection with the stone; in other cases the original condition of the entire tool has been learned from the study of analogous tools still in use among primitive peoples, or by the use among modern Indians of similar implements in which the stone part has been replaced by pieces of iron or steel, obtained from the whites.

springy sapling, from which they swung by a leathern thong directly over the mortar, the greater part of the weight being taken up by the wood.

The most artistic aboriginal work in stone was lavished on tobacco pipes, which, like all hand work, were never twice alike, and offer among them a great range of effort from a simple bowl with a stem continuing in the same direction, to an elaborate effigy, attached to a stem placed at right angles to the main axis of the figure. A pipe in the collection of Smith College represents a squatting human figure, holding in his arms a relatively large bowl, but with all the lines so softly executed that both the bowl and the lines of the figure are felt rather than too definitely expressed—the work of some prehistoric and forgotten Rodin. It may here be noted, that, as in this case, whenever a human head or face is included in the pipe design, it is so placed as to look inwards, towards the smoker, rather than outwards, towards the smoker's associates.

Then follow several classes of stone objects designated as "problematie." Many of these, like the flat banner-stones, and the various shapes of "pendants" were probably for the decoration of the person, designating the wearer as one distinguished in some way from his fellows. Many of these are of slate or of soapstone, material easy to work and not able to stand a hard strain. Some pieces are crude attempts at sculpture, such as the "bird-stones" which plainly represent these creatures, or small human effigies, possibly fetishes or idols. Similar carvings are found, executed in bone or wood—naturally easier materials to work than stone, but less enduring from the standpoint of the archeologist. Still

other problematic objects occur, often well shaped and executed with considerable care, that are usually designated as "plummets" or "sinkers," and which may easily have been loom-weights for holding and keeping taut the warp threads in a loom. Some of these, too, may have hung as pendants from necklaces, and have thus a decorative significance.

63. *American Articles of Bone, Shell, and Similar Materials.*—These, like stone implements and pottery, occur abundantly in shell heaps, and mounds of various sorts, and in association with graves. The bone articles form the usual variety found in Neolithic culture-sites everywhere, and consist largely of awls, bodkins, scrapers, and similar tools. By notching a pointed shaft one or more times, an effective fish-spear is produced.

Shells were everywhere in extensive use employed either as they are, or more or less elaborated.¹ The unworked shells of many bivalves, such as clams, unios, and mussels, were employed singly as dishes, spoons, and ladles, or scrapers, and a pair of small ones used together formed a practical pair of tweezers for eradicating a straggling beard.

Attached to a suitable handle a single shell of a large

¹ For an important early paper on shell ornaments, cf. W. H. Holmes, "Art in Shell of the Ancient Americans." This is found in the 2nd Ann. Report of the Bureau of Ethnology, 1880-81. Beauchamp, in the Bulletins of the New York State Museum at Albany, has written numerous memoirs upon the objects made by the aborigines, and there are to be recommended in connection with this especial subject his "Wampum and Shell Articles Used by New York Indians," in March, 1901, and "Horn and Bone Implements of the New York Indians," March, 1902. For his papers on stone implements and on pottery, cf. the references in footnotes elsewhere in this chapter.

bivalve formed a fairly useful hoe or shovel, and a ponderous univalve, like *Strombus*, fitted upon the end of a stick, often served as a war club, or *casse-tête*. Handled in the proper manner, a shell could be cut or carved, and in this way was constructed a great variety of ornaments, such as pins, pendants, or perforated disks, and the great variety of perforated objects to be strung in series, *i.e.* beads. It was even possible, although not common, to make a simple shell axe, or celt, from a very heavy shell, like a *Strombus*, somewhat after the model of the much more abundant stone celts.

Considerable decorative or pictorial art was frequently displayed in engraving upon smooth shell disks, and these results sometimes bore a striking resemblance to the art of the Aztecs, as appears upon their stone carvings or in their famous parchment books, or codices. This is especially true of a number of such disks from the mounds of Missouri and Tennessee, which suggest either the development of a local school of art, or an actual commerce with the civilizations further south of them.¹

Over the northeastern part of the United States and Canada, however, the main direction taken by shell art was in the production of small beads of two or more colors, and the weaving of them into belts of various patterns, which possessed a definite meaning, true pietographs. Such beads are commonly termed *wampum*, from the Algonquin word *wampi* (white) by which they designated the white beads only, *wampumpeag*, in dis-

¹ Cf. illustrations to article by MacCurdy, "Shell Gorgets from Missouri," in *American Anthropologist*, Vol. 15, 1913, esp. figs. on pp. 405, 406, and 407.

tinction from the *mowesu*, or *suckanhock*, the black ones. In the east they were slowly and laboriously constructed, one at a time, from the shell of a variety of mollusks, especially *Sycotypus*, and the hard clam, or quahog, *Venus mercenaria*, the white and purple portion of which



Fig. 74.—Shell gorget with figure strongly suggestive of Mexican art. Found at St. Mary's, Perry County, Mo., and now in the collection at Yale University. (After McCurdy.)

furnished the two colors commonly used. These beads were used as money, the purple being of the greater value, and possessed an intrinsic worth because of the large amount of labor expended upon them. This labor was, of course, infinitely greater than that employed by

the English in the manufacture of glass beads, and this disparity gave an opportunity for deceit on the part of the whites, which the latter seem to have used to their benefit, especially in the purchase of land.¹

More elaborate wampum belts, wrought into complicated figures, had a more or less definite meaning, which could be read by those familiar with the significance of pictographs, and were thus used to impart information, especially in their councils, where they served as important documents, such as intertribal treaties. (Fig. 75.)

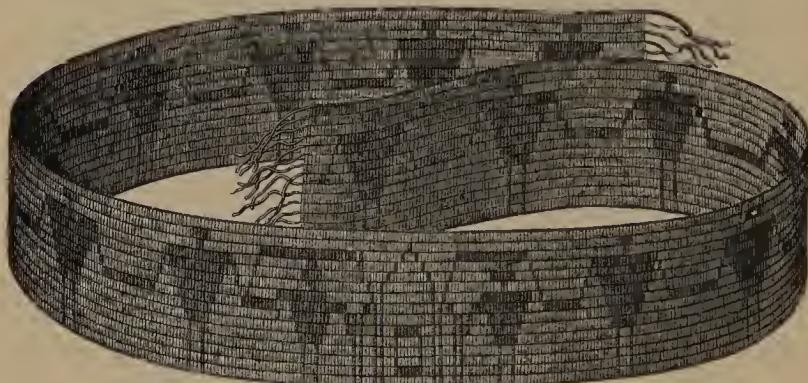


Fig. 75.—A wampum belt belonging to the Onondagas. (After Holmes.)

64. *American Metal Work*.—Objects of metal, of copper, of bronze, silver, or gold, in the form of medals, brooches, or religious or fraternal emblems, are frequently found in late Indian graves, and indicate contact with European culture through traders and missionaries. It is absolutely proved, however, that there occur also objects of copper, as also of the more precious

¹ A recent memoir upon the use of wampum is that of Frank G. Speck, "The Functions of Wampum Among the Eastern Algonkian," in Mem. Amer. Anthropol. Assn., Vol. 6, No. 1, 1819.

metals, gold and silver, which were of aboriginal origin, without suggestion of European provenance, and often probably antedating in age the advent of the first European discoverers. Such native objects are made, of course, of those metals which are found in the New World in a free state, like the copper of Lake Superior, and, when found at a distance from their source, they indicate an extensive intertribal commerce.

These aboriginal metal objects are made, not by molding or casting, but by being hammered out in a way similar to the usual treatment of stone implements. The difference in physical properties between a piece of flint and a piece of pure native copper is such, that the result of such treatment, while it chips the first, flattens the latter into a thin plate, or draws it out into a wire. The aborigines seem to have been slow to perceive these differences, and the prevailing endeavor seems to have been to reproduce the shapes of the old stone implements in these new kinds of stone, the native metals. Naturally, owing to their rarity, nuggets of gold were used only as ornaments for the person, while copper was used, not only for this latter purpose, but frequently also for such tools and weapons as axes and spear points. Such a type of industry is termed *cyprolithic*, or copperstone, and where this industry is distinct, it may be used as a basis for establishing a *Cyprolithic Age*, interpolated between the Neolithic Age and that of Bronze—continued experiments with the native metals gradually leading, through the discoveries of casting, and later, smelting, to the use of various alloys.

In Europe this was actually the course taken, but in

America, at the time of the discovery by Europeans, the aboriginal Americans were at best no further along than well developed Neolithic peoples, just entered upon a Cyprolithic culture in some places.

There is no doubt but that the early European traders, intently observant of the objects which the Indians valued, manufactured in Europe and brought over for trade purposes large numbers of copper beads and other trinkets; but these may always be distinguished from the native objects by a simple chemical analysis, since in all European copper, which is obtained from the ores, there are always traces of the lead, iron, cobalt, nickel, and other metals, which occur there, while in such copper as the Indians could get before the coming of the Europeans, the metal was pure, without such traces. Naturally, such aboriginal copper artifacts are most plentiful in the vicinity of the natural supply, and it thus happens that the state of Wisconsin surpasses all other North American regions in the abundance of such objects, more than twenty thousand of which now occur in the museums of that state.

As used for ornament, copper is most frequently met with in the form of sheets, disks, or tubes, the shapes which could be the most readily beaten out from native pieces found free, and it is in such forms that the early travelers and discoverers described and figured it. Among the late graves, and even among recent Indians, are occasionally found breastplates composed of small copper tubes, woven together in a definite pattern by thongs, and while in recent years it would be quite possible to obtain such tubes from Europeans, they would be most readily manufactured from small native

pieces by first beating them into plates, and then rolling them up. The famous "Skeleton in Armor," found at Fall River, Mass., in 1841, immortalized by Longfellow as "a Viking bold," and burned up a few years later by the destruction of the Fall River town hall by fire, was undoubtedly equipped with a breastplate of this sort.



Fig. 76.—Plate published in 1591 by De Bry, representing American aborigines well decorated with copper ornaments, including earrings, necklaces, bracelets, leglets, and pendants hanging from the waist. As this plate was drawn so long ago, it is very unlikely that any of the copper objects shown here were of European prevenance. (From Moore, after De Bry.)

In manufacturing metallic objects, the aborigines evidently knew the effect of annealing, that is, of softening the copper by heat, but there seems to have been little if any suggestion of actually melting the metal, and running it into a mold when molten. This would undoubtedly have been the next step in development,

judging from the history of culture in Europe, but this step seems never to have been taken until the advent of men from across the ocean with their vastly higher civilization. At the very beginning of this phase of history iron knives and axes, brass kettles, swords and muskets, were introduced, and the native cyprolithic culture was lost at once.

Concerning the aboriginal use of gold, it will be remembered that in some parts it was found in considerable abundance at the time of the discovery, and it was the presence of aborigines decorated with beads, pendants, rings, bracelets, and other gold ornaments, which awakened the cupidity of the Spaniards. In his work on the antiquities of Chiriqua (cited below, *sub American Pottery*) MacCurdy describes many grotesque images of gold, or of a sort of aboriginal gold plate, and discusses the possible methods of manufacture. It seems very certain that, at least in the case of gold, the American aborigines were in possession of the art of melting the metal, and casting it in molds, as this was described by both Spanish and English writers of the sixteenth century. The Americans, then, at the time of discovery, were locally, wherever they could obtain the free metals, not merely in the Cyprolithic but well started in the first experiments leading to the culture of the Bronze Age. This great advance, however, was found only in a few places, although the products of this culture were distributed by means of an extensive commerce to peoples who had not yet gained the ability to manufacture such things themselves.

65. *American Basketry and Weaving*.—In no way has a more grateful light been thrown upon the study

of prehistory by the aborigines of America than in the fields of basketry and weaving, for in these two sister industries the material products are so perishable, that only in the rarest cases are actual specimens of them preserved. These people, when first brought to the notice of Europeans, only four hundred years ago, were living in the midst of a typical Neolithic culture, exactly that period which has witnessed in Europe the origin, growth, and almost complete development of these industries.

We have, in the first place, a goodly number of early accounts of the industries of various Indian tribes, and, in the second place, there is the chance to observe these industries conducted in nearly the aboriginal manner, for, even, in spite of the introduction of modern machinery, with modern mills and factories, there are still plenty of Neolithic fingers that are content to accomplish the work in the old way.

In Chapter III the origin of both pottery and basketry has been traced to the devices gained in primitive house-building, when first the need of constructing a firmer wall of twigs and branches caused man to improve upon the simple heaping up of these materials, and led to a systematic intertwining of twigs and to daubing them over with clay. The gradual acquirement of various types of "stitch" in weaving the twigs led to the *basket*; the building up of a clay cover over the framework became the *pot*. *Cloth* differs from a basket or a woven mat only in the kind of material used, and the employment of various vegetable fibers and of hair and wool of animals, developed the art of *weaving*. "No wide gulf separates the different varieties of tex-

ties . . . beginning with such coarse products as brush fences and fish weirs and ending with the finest lace and needlework.”¹

Mason ascribes the origin of basketry and weaving, including the discovery of the various materials used, and the technique of *dyeing*, to women. He states: “With a few exceptions the makers of baskets are women. In the division of labor belonging to the lowest stage of culture the industrial arts were fostered by women, the military and the aggressive arts by men.” Again he says: “The first and most versatile shuttles were women’s fingers. Machinery has added speed. But there are many niceties of technique to which the machine device cannot yet aspire.”

There are two fundamentally different types of basket, the *woven* and the *coiled* or *sewed*. In all forms of weaving, whether basket, mat, or cloth, there are two sets of elements running at right angles and intertwined with each other. Of these one, often the stiffer, and always the one taken as the more fundamental, is the *warp*; the other is the *weft* or *web*. The warp is first set up, approximately in the position it is finally to assume

¹ Otis Tufton Mason, our best authority on Indian basketry and kindred subjects. His most important work, appearing in the Annual Report of the Smithsonian Institution for 1902, bears the title “Aboriginal American Basketry: Studies in a Textile Art Without Machinery,” and consists of some 375 pages, interspersed with more than 200 text-figures and followed by 248 plates. Both this and the other quotations used in this section are taken from this work. Other important works by the same author, referred to elsewhere in this book, and fundamental to students of the development of human culture, are “Woman’s Share in Primitive Culture” and “The Origin of Invention.” Chapter III in the first of these two books deals fundamentally with all forms of weaving, including basketry.

and the weft is woven across the warp, one thread at a time.

There are three sub-varieties of woven fabrics employed for baskets, (a) the *plain* weave, (b) the *wickerwork*, and (c) the *twined* weave. In the first of these the warp and weft are alike, and are simply placed alternately over and under each other, giving an effect like a checkerboard. By allowing the weft to run over two, three or four of the warp threads a diagonal or diaper effect is produced, and by introducing a dye to differentiate the two sets, or by making the two sets of splints of different widths, or by using different materials, still other kinds of patterns will be produced. Wickerwork requires a rigid warp, such as would be made by pliant osiers, and a more supple weft, such as could be introduced by rushes or thin splints. This is the style of the majority of cheap baskets in use among the more civilized peoples; it is also the form which makes the best fish-weirs. The third type, the twined weave, has the greatest number of truly artistic possibilities, and that and the other main type, the coiled ware, have ever been the favorites among aboriginal experts. There is a single row of strands forming the warp, but there are two wefts which are carried across the warp together and after passing a strand of the latter make a half turn or twist, so that their position relative to the outer and inner surfaces is reversed. By the use of two colors for the two wefts, and the retention of one of the wefts upon either side desired for two or more warp threads, a pattern, of greater or less complexity in accordance with the skill of the artisan, may be produced.

Coiled ware is not woven in any sense of the word,

but is laid in the form of a coil, and the last portion of the coil is continually sewed to the previous coil. By employing these principles, and only these, the aboriginal American woman has devised an endless variety of styles of baskets, and in these her inherent love for beauty has found expression.

“As you gaze upon the Indian basket maker at work, herself frequently unkempt, her garments the coarsest, her house and surroundings suggestive of anything but beauty, you are amazed. You look about you, as in a cabinet shop or atelier, for models, drawings, patterns, pretty bits of color effect. There are none. Her patterns are in her soul, in her memory and imagination, in the mountains, water courses, lakes, and forests, and in those tribal tales and myths which dominate the actions of every hour. She hears suggestions from another world. Her tools are more disappointing still, for of these there are few—a rude knife, a pointed bone, that is all. Her modeling block is herself. Her plastic body is the repository of forms. Over her knee she molds depressions in her ware, and her lap is equal to all emergencies for convex effects. She herself is the Vishnu of her art, the creator of forms!”

The weaving of cloth differs from that of baskets merely in the texture of the materials used. In cloth, too, there is usually a more complicated technique employed in the preparation of the material to be woven—that is, the art of *spinning*, which is preliminary to weaving, and the counterpart of which in basketry is simply the gathering and the preparation of the splints or rushes. Spinning, which is essentially a twisting together of fibers to make the yarn or thread, requires, as its first essential, some form of spindle or rotating stick. In the type universal in Europe this spindle is a sort of

top, and consists of the *spindle* itself, a straight stick, and the *spindle whorl*, a disk or wheel to supply the weight. The more usual American type, instead of a spindle whorl, is fitted with a long, narrow block, which rotates around the spindle, exactly like a watchman's rattle, and the thread is attached to this instead of to the spindle. A technique still more primitive than either form uses no spindle at all, but twists the yarn between the two palms, or between the palm of one hand and the upper surface of the thigh, the spinner sitting on the ground with legs extended.

When the yarn is once prepared the process of cloth making begins at the same place as does the making of a basket after the material is gathered; only the yarn is so much finer and more pliant than are the basket splints that more complicated devices may easily be employed in the weaving. All the warp threads for an extensive piece of cloth may be set up at one time, and the weft may be run across them at one stroke. Furthermore, by placing a stick called a *huddle*, or *heald*, across the warp, and attaching to it certain of the warp threads—every alternate one in simple weaving—and then drawing the heald toward the weaver, the warp becomes separated into two layers, which are so distinct that the weft may be put across the entire line at one motion, thus effecting in a moment the same result that in a basket demands the twining of the weft across the warp, a strand at a time. The weft thread, instead of being held at the end in the fingers, is now more conveniently wound about a little short stick, the *shuttle*, and this is passed between the two systems of warp threads, separated by the heald.

This process in its most simple and elementary form, is frequently met with in America, both North and South, and by this the entire evolution of the industry may be traced. Thus the women of British Guiana weave their *queyus*, or embroidered aprons, upon a frame consisting

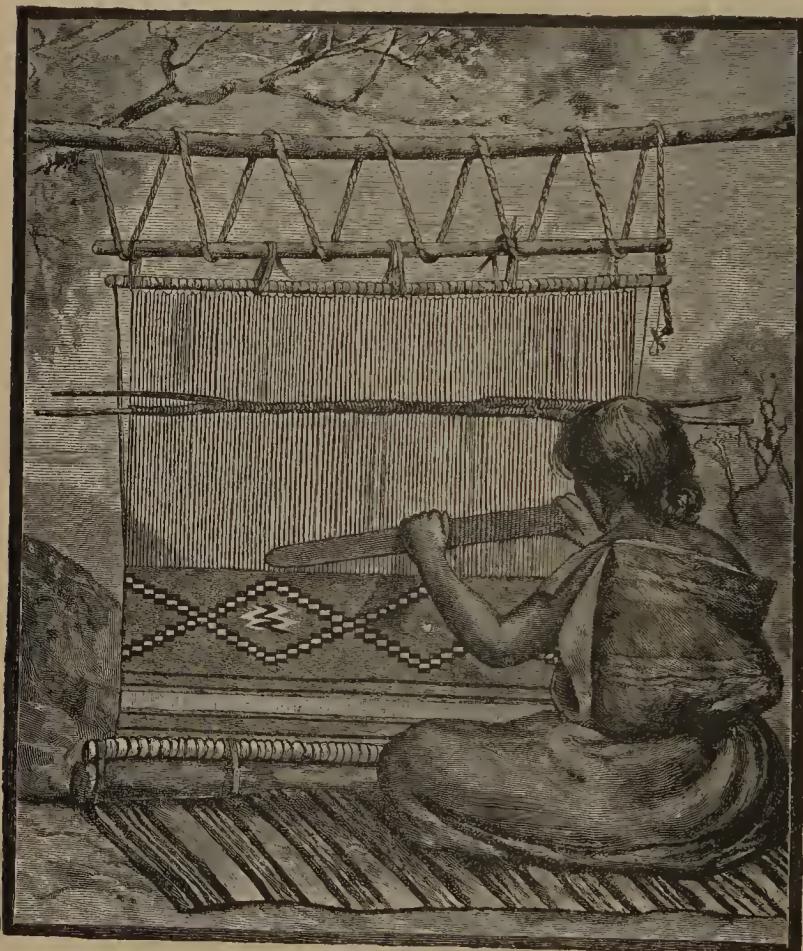


Fig. 77.—Ordinary Navajo blanket loom. The heald, to which the warp threads of the lower shed are attached, and the batten or sword-shaped stick for pushing down the west, are well seen. (After Matthews.)

of two sticks, the one straight, the other curved, and shaped like a capital letter D. Across this loom the warp threads are stretched, spreading a little at the ends which are attached along the curved stick, and placed a little nearer together along the straight one. Better and more complicated looms are met with among other aboriginal peoples, until we find among such skilled weavers as the Navajos the ability to manufacture the most beautiful and artistic rugs and blankets.¹ Cloth of many patterns, often showing the greatest skill in stitch and in the introduction of patterns, are found in greatest abundance in the graves of the pre-columbian cemeteries of Peru, where the dry air of the high altitudes, and the dry, sandy soil, have combined to preserve, often with a startlingly modern appearance, the clothing of the individual interred, who died before the New World had been discovered by Europeans.

Aside from weaving, the variations and elaborations of the textile industries embraced in the words *sewing*, *netting*, *knitting*, *lace-making*, *knitting*, *crocheting*, and embroidering, have all been evolved by primitive women of Neolithic culture, and have been preserved, often in their earliest and most elementary form, among the native inhabitants of two Americas.²

¹ An excellent paper on the Navajo weavers, describing their looms and the technique of rug making, is that by Washington Matthews, found in the Ann. Rep., Bureau Ethnol., Vol. 3, 1881-82.

² A fundamental analysis of the arts of weaving, including the allied industries, will be found in the two books by Otis Tufton Mason, already cited, "Woman's Share in Primitive Culture" (Appleton, 1899), and "The Origin of Invention" (Scribner, 1915). The author's dedication of the former "to all good women, living or dead, who with their brains, or by their toil, have aided the progress of the world," is significant.

66. *American Pottery*.—As elsewhere among Neolithic people, the potter's art was highly developed among the American aborigines, and owing to the almost indestructible nature of the material, the broken remains of objects of baked clay, *shards*, are an almost constant accompaniment of excavation.¹

Pottery has developed everywhere in response to one of the first needs of humanity, at least as soon as men possess settled houses and families, namely that of the transportation of water. In a few favored localities, such as a cave with dripping water, or an encampment upon the side of a river or lake, or near a living spring, this want is not especially felt, but in a dry country where water sources are not ever at hand, each individual, if he has no means of transporting water, must make daily pilgrimages of some distance to slake his thirst, and the habitual use of water for any other purpose is not to be thought of. Water in very limited quantities may be transported in hollow shells and especially in gourds; wherever the bamboo abounds cylin-

¹ Cf. especially the article by Cushing, upon the pottery of the Zuni Pueblos, in *Fourth Ann. Rep., Bureau of Ethnol.*, 1884-85. For illustrations of pottery, cf. various articles by Holmes, Fewkes, and others scattered through the volumes of the above series, for example, Vols. 3, 4, 6, 13, 17, 20, 22, *For a sketch of the development of the pot from the basket*, cf. O. T. Mason, "Woman's Share in Primitive Culture."

As one out of a large bibliography of works on American aboriginal pottery, may be mentioned a recent work by MacCurdy, "A Study of Chiriquian Antiquities," a quarto memoir of the Connecticut Academy of Arts and Sciences, with 250 pages of text, including 380 text-figures, and with 49 plates, many of them colored. It contains several pages of bibliography. *Mem. Conn. Acad. Arts and Sci.*, 1911.

For plates of Arizona pottery, cf. Hough in *Annual Report of the Smithsonian Institution*, 1901 (published 1913). This contains 101 beautiful plates.

drical buckets may be made of its stems, but such means alone are insufficient for the needs of humanity in general, and the inventive faculty is stimulated to provide receptacles more universally accessible.

To supply these needs there have been at least two lines of development; first, the employment of the skins of animals, leading to the skin water bottle in use in many parts of the world, and second, the attempt to make a basket tight enough for the purpose. The first of these lines is a simple one, and may easily have been developed through the use of a raw skin to line a cooking hole, that is, a small depression in the ground, filled with water, which is brought to a boil by heating small stones in a neighboring fire and dropping them in at frequent intervals. The other line is very complicated in its development, but has led to vastly better and more serviceable results. The art of basketry is one of the most primitive of industries, and with the wealth and variety of the materials furnished, and the ease of manipulation, the artificer, generally a woman, requiring nothing but her fingers for the construction, easily attains a high degree of skill. Many primitive peoples of the present day construct baskets that are practically water-tight, and there is no reason to believe that this art could not have been attained in early times. However, an easier and perfectly natural step to take to obtain the same result with less skill or effort, would be to employ pitch, clay, or other plastic material, to fill the interstices and render an ordinary basket water-tight.

In the life of a modern city dweller clay is a substance rarely met with, but it continually takes the

attention of a primitive man living in an untamed natural environment. To such a man the daubing a basket, either inside or out, with clay, in an attempt

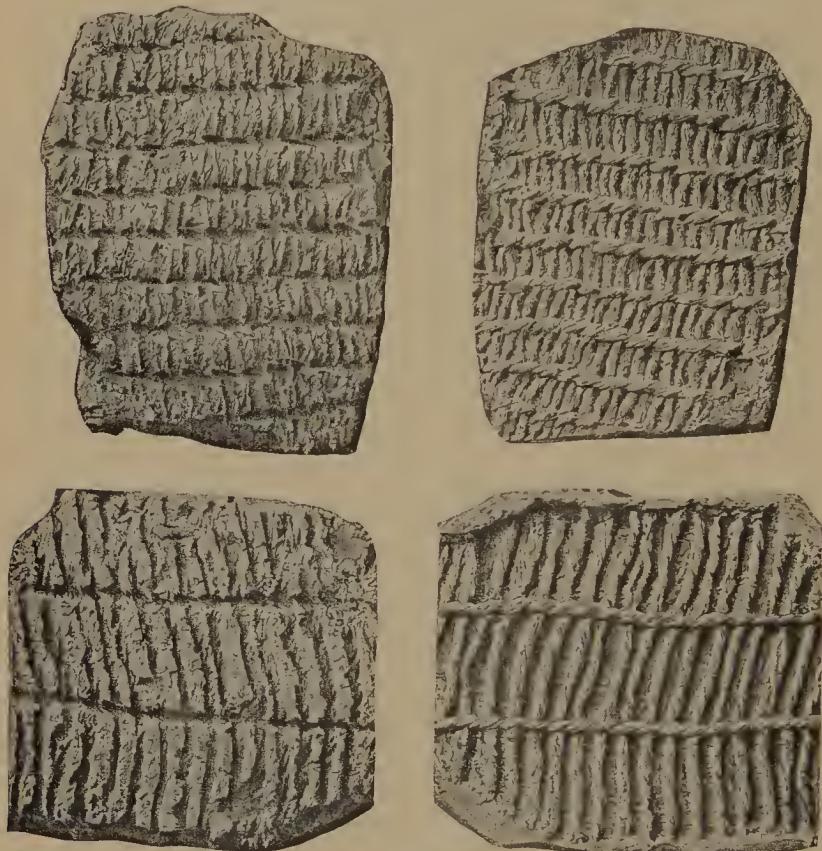


Fig. 78.—Prehistoric American shards, with the impressions of the textiles upon which they were originally built; also casts from these made in plaster, and showing the positives of the textiles themselves. (After Holmes.)

at making a serviceable water receptacle, is the simplest of acts, and one undoubtedly discovered independently thousands of times, and employed by every primitive family with whom the need arises. When, however, the

clay dries, or perhaps becomes baked by being accidentally left in or about the fire, it parts company from the basket, and forms an object which, used with great care, may be employed as a utensil by itself, a true piece of *pottery*.

The birth of pottery is thus inseparable from basketry, and there follows a long period of development, during which every pot is formed either upon or within a basket. This has two fundamental results; first, primitive pots take the forms originally devised for baskets, and retain certain limitations imposed by the textile material, and second, they possess an external surface, covered with the impression of the basket stitch. Shards of such early pottery, impressed by the stamp of the basket which served as a form or mold, are frequently met with in excavation; and by using them in turn as molds, and covering the surface with plaster of Paris, the details of numerous kinds of prehistoric basketry have been recovered.¹

When, now, this stage is reached, it is not long before the art is acquired of forming the clay utensil directly, without the use of the previously constructed basket, and these endeavors take two distinct forms, *coiled* ware and *molded* ware. Coiled ware copies in clay, so far as possible, the technique employed in making a coiled basket; it is a basket of this type made of a different material. To make such a utensil an actual clay rope is first made by rolling the clay in the flat hand; this is then used to make any shape desired, and within the possibilities of a coil. The separate coils are then tightly

¹ W. H. Holmes, in Second Ann. Rep., Bureau of Ethnol., 1880-81.

fused together by making "stitches" at intervals—places where the clay of two adjacent coils is pinched together—and the dish is finished.

Molded ware gets farther away from the idea of the basket, and the technique of making it is a new one.

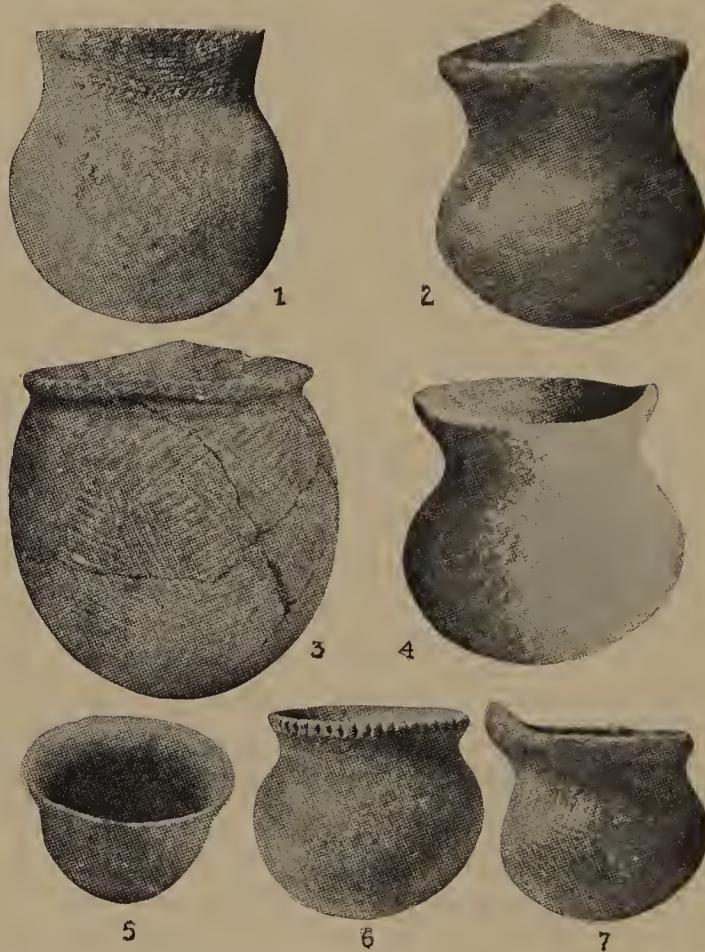


Fig. 79.—Iroquoian pottery vessels. These have got somewhat away from the basket, and have been moulded directly with the hands, but the symmetry is that of the eye, and there is no suspicion of a potter's wheel. (After C. Parker.)

Here a piece of clay sufficient to make an entire pot is taken, and molded into shape by thumb and fingers. There are here no clay rope and no stitches, but the shape becomes gradually perfected under the hands of the potter, a shapeless mass eventually assuming the shape and proportions desired. Naturally such utensils are made round, like baskets, an idea from which men are seemingly loth to depart, but there is no reason in the technique for making them so, and square dishes occasionally appear, and even eccentric forms in the shape of birds or other animals are quite possible. In molded ware of the round form, varying between the form of a tall cylinder and a flat dish, it is impossible to center them exactly and hand-made pots stand more or less lopsided, as one side is sure to overbalance the rest. This is eventually obviated by a great invention, the *potter's wheel* which is a solid wheel horizontally placed and made to revolve rapidly by some simple mechanism, perhaps a treadle. When a lump of clay is placed in the middle of this wheel, and touched by a stick or other firm object when revolving, every contact surface becomes a part of a circle, and the entire lump rises or falls, spreads or flattens, always in exact response to what is done to it along the side. This exact shaping takes place rapidly, and the result is perfectly centered—a high achievement, and one which necessarily takes the place of all cruder methods wherever it can be installed. So complex a mechanism is above the level of Neolithic culture, and no parts of such a machine are ever found in Neolithic remains, nor do any Neolithic shards show the mathematical accuracy of wheel-made pottery. This sort the Indians

never developed and a wheel-made shard means a post-Columbian deposit.

But it is not enough for either the prehistoric or the modern potter simply to make a utensil of the proper shape: the aesthetic feeling demands that it be decorated. The beginning of this is seen in the impress of the basket weave upon the outer surface. This is at first looked upon as a natural and necessary surface effect, and is missed when pots are made direct. All sorts of devices, therefore, are employed for producing this effect artificially, and this feeling forms one of the motives, perhaps the main one, for the production of incised ware, in which a pattern is produced upon the soft clay by incising it with some object, a stick or sharp bone, or even the finger nail. Further decorative effects are produced by the use of various mineral colors, at first rubbed into the incised lines, or used to cover the intermediate fields, but later employed alone upon a smooth surface. In all this decoration, beginning with the first incised ware, there has been a definite meaning, varying from the attempt to reproduce a mechanical effect to an elaborate symbolism based upon a complicated mythology and philosophy. The pottery of a primitive people becomes its library, and the first crude inscriptions and early records of a cultured race, aside from the more formal ones engraved upon stone, are inscribed upon clay.¹

¹ It is the further development of this idea that is seen in the real libraries of clay tablets, with their cuneiform inscriptions, found among the ruins of ancient Assyrian civilization. This method of writing undoubtedly first developed upon the sides of pots and vases, which, when the use of writing became more common, were replaced by cylinders and flattened tablets made for the purpose.

Thus for a variety of reasons—the abundance and the indestructibility of shards, the records of industrial development which they bear, the indications occasionally recorded of primitive beliefs and ideas—the field offered by the study of pottery is of first importance, especially in studying that fringe of the subject lying between prehistory and history. Shards, moreover, at once so permanent and so characteristic, like the guide fossils of the paleontologist serve to date a culture deposit, often with much accuracy and are thus valuable, not only in themselves, but in the light they throw upon other associated objects.

This short sketch of the development of pottery is based upon the observations of American ethnologists made upon the aborigines in this continent. In no part of the world has the material been so favorable for this study as here, since practically every step in this industry may be found in operation among the living, while the history of the past among the same people may be traced by the shards. Upon the arid plains of the Southwest of the United States, where water sources are few and scattered the importance of conveying and storing water becomes paramount, and largely on account of this, doubtless, the various arts connected with pottery have attained an especially high development. Here and elsewhere upon the western continent, anthropologists have the great advantage of studying the living artificers, watching the manufacture of the utensils, and learning from the lips of the people themselves the meaning and the symbolism of the details of the work and the steps of the process. Judging from the remains, the pottery of the European Neolithic and Bronze Ages has

evidently gone through a similar development, and these remains receive an interpretation by comparison with the practically identical productions of America of which the significance is known. When the American continent was discovered by Europeans it was entirely Neolithic, and possessed everywhere Neolithic stone implements, pottery, and textiles. In regions furnished with native copper the aborigines fabricated ornaments and numbers of simple tools and weapons of that metal, manufacturing them, however, by hammering them out with a stone hammer and without casting them in molds. They thus showed in favored localities the beginnings of a Cyprolithic, or copper-stone, culture.

67. *Classification of American Aboriginal Objects.*—As would be expected, the task of classifying the pottery, stone implements, and other objects of aboriginal manufacture is an extremely difficult one. The objects in question come, not from large and organized factories, but from the hands of individual artisans, who are bound by few conventions and in the shaping of each piece are free to vary the work as they wish, following every mood or whim, or the exigencies of the material. The systems in use by the various collectors and by the different museums have likewise been widely different.

The first subdivision, on which all agree, rests upon the material of which the artifacts are constructed, and includes (1) *stone*, (2) *bone* and *horn*, (3) *shell*, and (4) *copper*; (gold and silver are very rare, but may be met with). Pottery in the broad sense, including not only pots and vases, but pipes and figurines, might make another group. Beyond this the classification might be based upon *use*, and include such classes as arrow and

spear points, axes, scrapers, pendants, fish spears, and so on; or else, especially as the exact use of many of the artifacts is unknown, upon *shape* alone, without reference to use.

Some of the possibilities of classification are illustrated by the accompanying series of sketches, prepared some years ago by a committee from the American Anthropological Association, illustrative of a scheme of classification proposed, but not generally adopted.¹ The committee, on stating the principles on which its classification was based said: "The classifications here offered and definitions here proposed in some detail are based so far as possible *on form alone*. . . . It has been the particular aim of the Committee to avoid or to get rid of those classes and names that are based on uses assumed but not universally proven for certain specimens." (The italics are our own.) The committee further quoted a remark of W. H. Holmes, that "the difficulty in classification and in nomenclature comes largely from our lack of complete and detailed knowledge; with increased knowledge will come decreased difficulty."

The class of stone implements is naturally and obviously divided into those with chipped, and those with smooth surfaces; and the subdivisions of the former, as indicative of the possibilities, are as follows, illustrated by Fig. 80:

¹ This committee consisted of the following: Dr. Charles Peabody, Chairman; John H. Wright, J. D. McGuire F. W. Hodge and Warren K. Morehead. The sketches shown here were selected as types from the collections at the Peabody Museum of Archaeology at Cambridge, and permission to use the same was kindly given by Mr. Peabody.

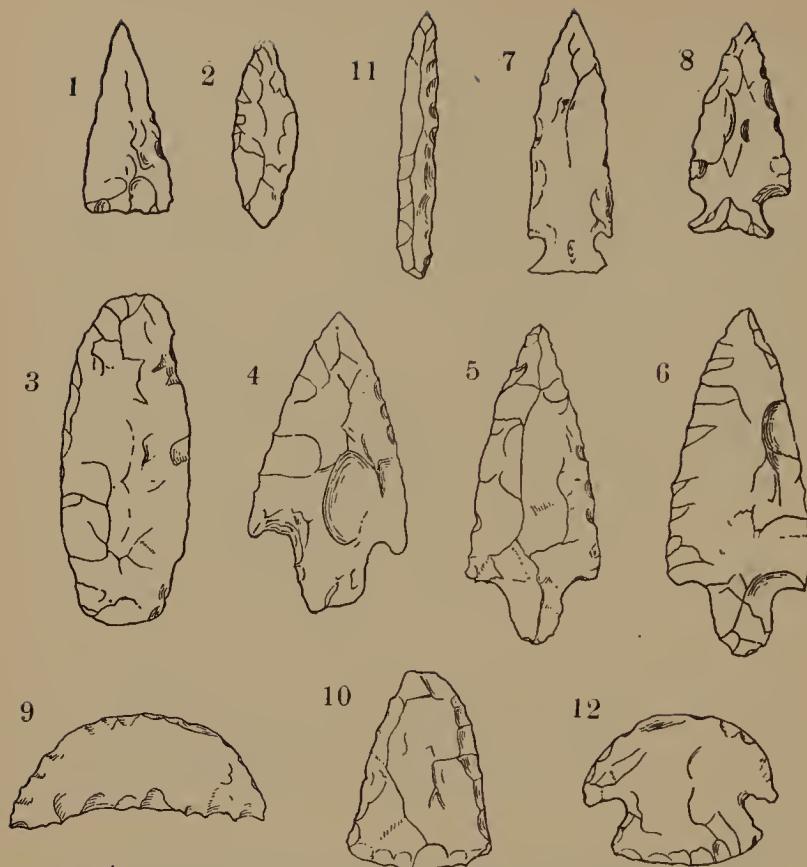


Fig. 80.—Outline drawings of chipped stone from the Peabody Museum, Cambridge, Mass., and selected as types of form, accompanying the classification given in the text. The numbers are those of the Peabody Museum.

Length cm.

1. No. 64398	4	Miss. Base straight.
2. No. 64397	3.75	Miss. Pointed at both ends.
3. No. 64405	8.5	Miss. Oblong.
4. No. 61796	6.0	Miss. Stem expanding; barbed.
5. No. 61796	6.0	Miss. Stem expanding, not barbed.
6. No. 61796	7.0	Miss. Stem nearly straight, slightly barbed.
7. No. 61869	5.0	Miss. Stem contracting, barbed.
8. No. 64234	4.0	Miss. Stem contracting, not barbed.
9. No. 1217	5.0	Cal. With two scraping edges.
10. No. 61874	4.0	Miss. With three scraping edges.
11. No. 64410	5.5	Miss. Rectangular in cross section.
12. No. 48816	3.75	Miss. Like a projectile point, but with the point become a curve.

(After Charles Peabody and the Committee.)

*Classification of Articles of Chipped Stone.***I. Knives, or projectile points.**

Larger—5 cm. or more in length.

Smaller—less than 5 cm. in length.

1. Without stem.

A. Flakes, long and thin.

B. Pointed.

(a) at one end { Base convex,
Base straight (Fig. 80, 1).
Base concave

(b) at both ends (cf. Fig. 80, 2).

C. Oblong (cf. Fig. 80, 3).

D. Circular.

2. With stem.

A. Stem expanding from base.

(a) Base concave } { barbed (Fig. 80, 4).
(b) Base straight } { or
(c) Base convex } { not barbed (Fig. 80).

B. Stem with sides parallel.

(a) Base concave } { barbed (Fig. 80, 5).
(c) Base convex } { or
(b) Base straight } { not barbed.

C. Stem contracting from base.

(a) Base concave } { barbed (Fig. 88, 7).
(c) Base convex } { or
(b) Base straight } { not barbed (Fig. 88, 8).

D. Shouldered implements.

(a) Chipped on one side.
(b) Chipped on both sides.**II. Scrapers.**

Types:

1. With one scraping edge.

2. With two scraping edges (Fig. 80, 10).

3. With three or all scraping edges (Fig. 80, 10).

III. Implements for Perforating or Engraving.

Types:

1. Round or rectangular in cross section (Fig. 80, 11).

2. With major and minor axes in cross section.

3. Varying.

IV. Implements for Percussion.

Types:

1. Shaped like a projectile point with the point become a curve (Fig. 80, 12).

2. Hammer-stones chipped before using.

(NOTE: 1. Forms may possess regular or intentional serration.
2. Forms may be combined or eccentric.)

The classification of pottery, as treated by this committee,¹ was based, (1) as to *decoration*; whether *plain*, *stamped*, *incised*, or *painted*; (2) as to *manufacture*; whether *sun-dried*, *burnt*, *hand-molded*, or *coiled*; (3) as to *material*; *clay*, *sand*, *shell*, and other combinations, and (4) as to *form*. Certain definitions applicable to pots and vases of various form were found advisable, as follows:

A simple vessel must consist of a *body*, and may have a *rim*, *neck*, *foot* or *handle*, or any combination of these.

1. *Body*.

A formation capable of holding within itself a liquid or solid substance.

2. *Rim*.

(a) A constituent part of the vessel forming the termination of the body.

(b) A constituent part of the vessel recognizable by a change in thickness of the substance in the terminal sections.

3. *Neck*.

A constituent part of the vessel recognizable by a more or less sudden decrease in the rate of increase or decrease of the diameter.

4. *Foot*.

A non-constituent part of the vessel recognizable by a diameter in cross section, whose rate of change is suddenly varied by the increased diameter of the body.

5. *Handle*.

A non-constituent part of the vessel consisting of some outside attachment.

Body. It is suggested that students, in comparing the forms of the cross sections of vessels, pay particular attention to the proportion of the diameter to the height and the rate of change of this proportion, and refer to the following definitions of the two dimensions. *Height*: Perpendicular distance from the base to the most distant part of the rim. *Diameter*: The length from any point on the sides to any other point distant 180° measured on a line perpendicular to the height. *Base*: The point of contact on a plane of contact of the body with a horizontal surface.

¹ Proposed by Mr. J. D. McGuire.

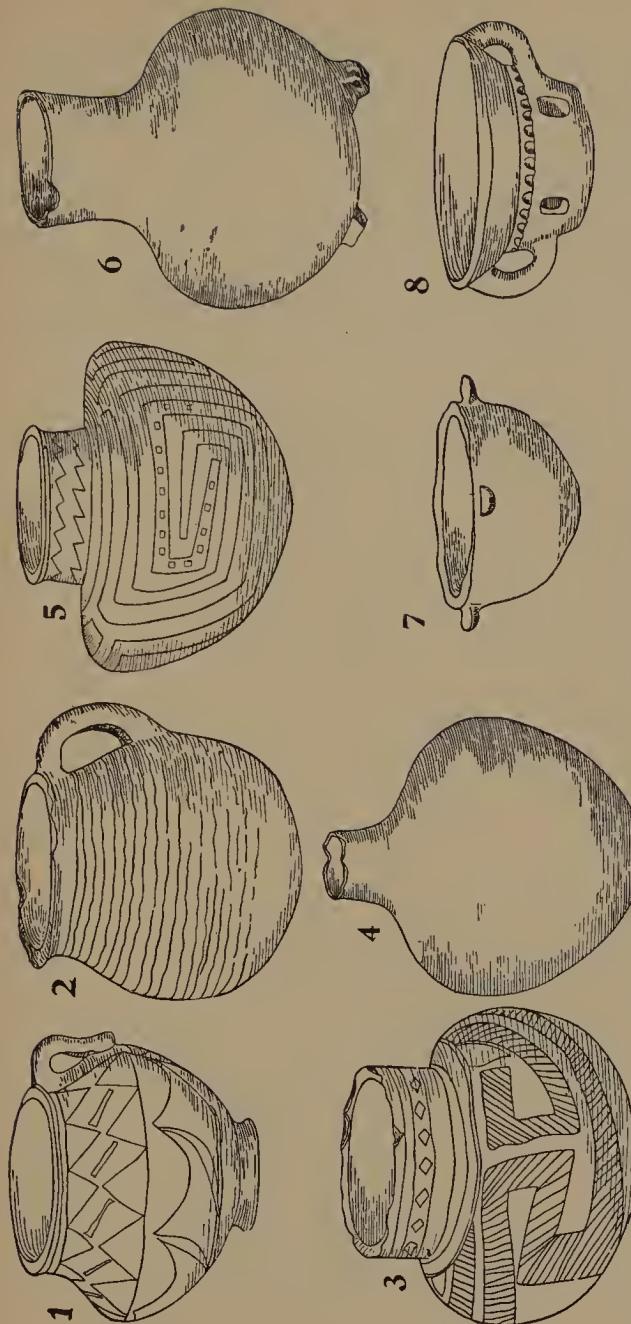


Fig. 81.—Outline drawings of pots in the Peabody Museum, Cambridge, Mass., selected as types of form, and used to illustrate the definitions and classifications given in the text. The numbers are those of the Peabody Museum. This specimen shows the typical parts: body, rim, neck, foot and handle.

1. No. 25220—Height, 15 cm.; diam., 18 cm. New Mexico. This specimen shows the typical parts: body, rim, neck, foot and handle.

2. No. 49862—Height, 15 cm.; diam., 18 cm. Colorado. Showing a neck with increasing diameter.

3. No. 702—Height, 15 cm.; diam., 18 cm. Arizona. Showing a neck with constant diameter.

4. No. K104—a neck with decreasing diameter. Height, 19 cm.; diam., 17 cm. Arizona. Showing a neck with decreasing diameter.

5. No. 72037—Height, 16 cm.; diam., 20.5 cm. Missouri. Showing non-continuous foot, with the distance between the axes of the feet decreasing (upwards) 10.5.

6. No. 21378—Height, 6.5 cm.; diam., 10.5 cm. Arkansas. Showing handle attached to body only.

7. No. 7449—Height, 6.5 cm.; diam., 13 cm. Brazil. Showing handle attached to both body and foot.

(After Charles Peabody and the Committee.)

The following analysis of form was presented:

Body: These are so various, depending on relative height and diameter of the cross-section, that an analysis is too cumbersome to be of service for general reference.

Neck:

1. With increasing diameter (Fig. 81, 2).
2. With constant diameter (Fig. 81, 3).
3. With decreasing diameter (Fig. 81, 4).
4. Combinations.

Lip: A constituent part of the neck of body recognizable by a suddenly increasing diameter of neck or body that continues increasing to the rim. (Fig. 81, 5.)

Foot:

1. Continuous—
 - (a) With increasing diameter.
 - (b) With constant diameter.
 - (c) With decreasing diameter (Fig. 81, 1).
2. Not continuous—

Differentiated by—

 - (a) Number.
 - (b) Angle with the horizontal.
 - (1) Expanding upward.
 - (2) Perpendicular to horizontal.
 - (3) Contracting upward (Fig. 81, 6).

Handles—Types:

Differentiated by—

1. Number.
2. Position on the vase.
 - (A) Body (Fig. 81, 7).
 - (B) Neck.
 - (C) Foot (Fig. 81, 8).
 - (D) Combinations.
3. Form.
 - (A) Continuous with body or neck.
 - (B) Not continuous with body or neck.
 - (a) With constant direction.
 - (b) With varying direction.
 - (c) With reentry upon vessel.

It is not intended in these pages to advocate this particular method of classifying aboriginal objects, nor has the scheme presented above been definitely adopted. There is only the intention to show that such objects, although representing the individual style of many artificers, untrammled for the most part by canons of taste,

are yet capable of scientific classification, expressing slight differences of form and other characters. Should these lines fall under the eye of an amateur collector, it will surely be of value to say that of all characters or attributes of an aboriginal object, be it flint point or clay shard, the exact locality where the piece was found, even often to the details of an individual field, is of the utmost importance—much more than the details of shape or the suppositions concerning the probable use, for these latter may be deduced at any time from the piece itself, while the details concerning locality, once lost or disassociated from the object, can never be put beyond doubt. While all are urged to collect aboriginal objects, classifying or arranging them in the way that most appeals to their individual tastes, it is the first duty for the collector to record the exact locality of each piece. The identity of a given piece may be fairly well secured by pasting, or better, painting, a number or letter upon it; it is also an excellent idea to keep a notebook, upon the pages of which each piece is recorded in outline, made by laying the piece directly upon the page, and tracing the outlines around it, much in the way of children who learn to draw their hands in the same manner. Upon each outline may be written the details of the locality, as well as the number it bears in the collection, and, thus labeled and described, even a small collection will be of ten times the value of one many times as large, with the locality labels disarranged or lost. It may even be said that the former will be of professional value, and forms a definite record of the past, while the value of the latter is practically nothing.

68. *American Architecture; Single Dwellings and*

Community Houses.—At the time of the discovery, and undoubtedly for a long time previous, the civilization of the American aborigines was that characteristic of Neolithic peoples everywhere; in some localities nomad hunters, or primitive agriculturists, and in others larger or smaller fixed communities. Of the first type, wandering from place to place, in pursuit of game, the usual form of dwelling was the *tent*, formed of skins, and easily transportable; while agriculture, even the care of a small field of maize, anchored the possessor to a definite spot, and developed various types of a more or less permanent *house*.

It is on the western plains of the United States that the tepee, an excellent type of the former, especially developed, and, being light and easily put up, this work was largely developed by the women. A tepee, or, more accurately, *tipi*, is a conical tent, made, as long as it was possible, of the dressed skins of buffaloes (bisons).

“The separate skins are cut and fitted on the ground into a single piece resembling the cover of an umbrella. The seams are all sewed tightly from top to bottom except one, which is fastened by a laeing from the top to within four or five feet from the ground. The opening thus left is the doorway, the door itself being a buffalo robe or piece of cloth, fastened above and left to hang loose, except in bad weather, when it can be tightly stretched by thongs, attached to the lower corners. The ground being selected, the tepee is spread out upon it. Three poles are lightly tied together near the smaller ends, and thrust under the covering, passed through the orifice at the top, raised upright, and the lower end spread out as far as possible. A rope or rawhide thong attached to the top of the covering is then thrown over the crossing of the poles. One woman pulls on the end of

this rope, while another adjusts the tripod of poles until the covering is stretched vertically and laterally. The other poles are then carried in one by one; the small end, thrust through the top opening, is laid against the point of crossing of the first three, the large end being carried out as far as possible. When all the poles are in, they are arranged equidistant, in a circle, stretching the covering as tightly as possible, a few wooden pins are driven into the ground through slits in the bottom of the covering on the outside, and the work is done. . . . Two quiet working women can put up a tepee in five minutes, and take it down in three. To prevent the wind from blowing directly down the top, a sort of winged cap is provided, managed from below with strings, or a deer-skin fastened between two poles is set up on the windward side of the opening. It is shifted with the wind.”

In southern New England a similar type of hut was made of a framework of light wood, clothed both within and without with woven mats, the work of the women. They are thus described by the Plymouth Pilgrims, who saw them for the first time on Cape Cod:

“The houses were made with long sapling trees, bended and both ends stuck into the ground; they were made round, like unto an Arbour, and covered downe to the ground with thick and well wrought matts, and the doore was not over a yard high, made of a mat to open; the chimney was a wide open hole at the top, for which they had a mat to cover it close when they pleased; one might stand and goe upright in them, in the midst of them were foure little trunches knockt into the ground, and small sticks laid over, on which they hang their Pots, and what they had to seeth; round about the fire they lay on mats, which are their beds. The houses were double matted, for as they were matted without, so were

¹ O. T. Mason, “Woman’s Share in Primitive Culture,” pp. 153-54

they matted within, with newer & fairer matts. In the houses we found wooden Boules, Trayes, & Dishes, Earthen Pots, Hand baskets made of Crab shells wrought together, also an English Paile or Bucket, it wanted a Bayle, but it had two Iron eares: there was also Baskets of sundry sorts, bigger and some lesser, firmer and some coarser: some were curiously wrought with blacke and white in pretie workes.¹

Among a few tribes, like the Iroquois (the Ong-wanonsioñni, "we of the extended lodge"), an advanced communism made it possible for a number of families to unite in the construction of a common dwelling, and where, as in the treeless country of Arizona and New Mexico, the buildings were constructed of stone rather than wood and were added to from time to time, there arose a mass of continuous houses, usually placed at various levels, the *pueblo*.² Such structures more usually crowned the summit of an elevation with precipitous sides, a typical *acropolis*, but in the cliff region of Utah and Colorado, huge niches cut out by nature upon the face of well-nigh inaccessible cliffs, and improved by the hand of man, offered facilities in some ways superior to those of an isolated summit.

Of the various types of wooden dwellings, the foundations may be sometimes traced by the disturbance of

¹ "Mourt's Relation: An account of the exploration sent out by the *Mayflower*, when stationed in Provincetown Harbor, November, 1620." This account was probably written by William Bradford.

² Cf. the various Annual Reports Bureau of Ethnology, Washington, e.g., the paper by V. Mindeleff on "Pueblo Architecture," 8th, 1886-87, and the more recent one of Fewkes, 22nd, Pt. 1, 1900-01. C. Mindeleff, in the 17th Annual Report, treats of Navajo houses, and Fewkes, in the same volume, describes an expedition to Arizona, including details of cliff-house ruins, and makes a study of food bowls and their decoration.

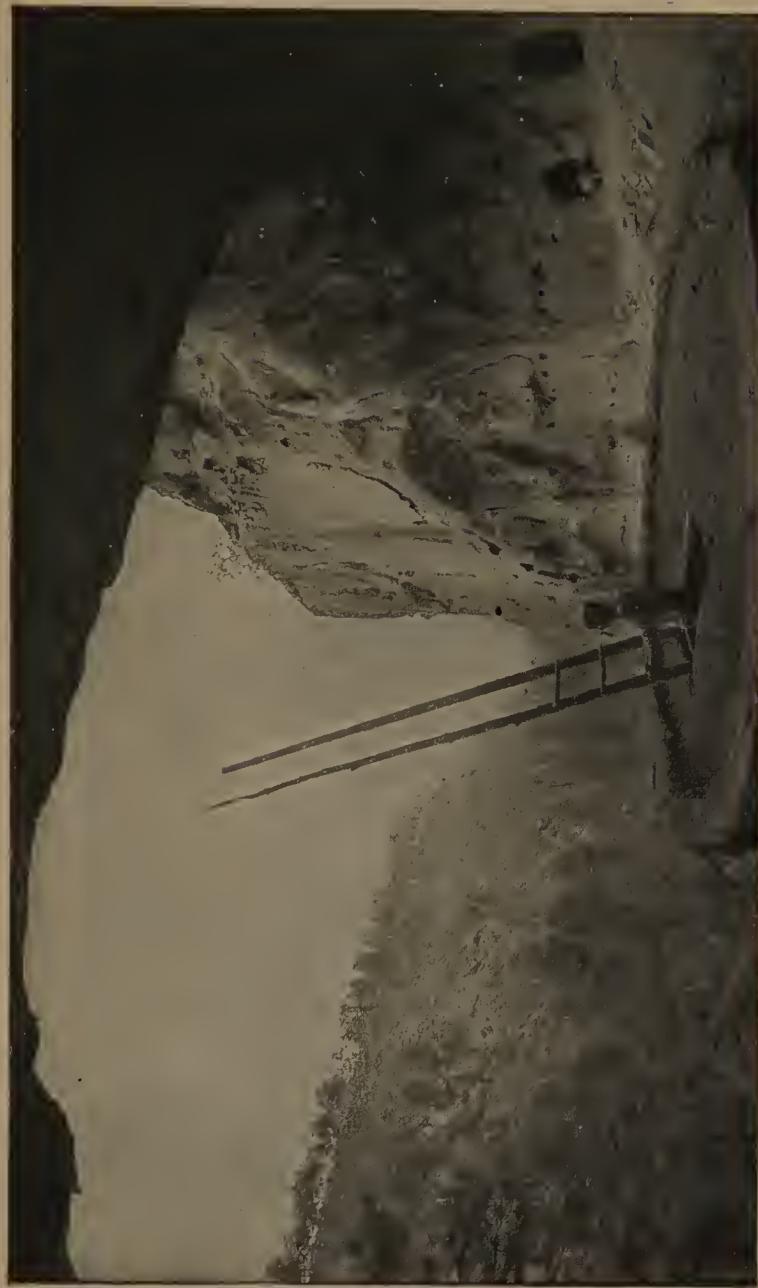


Fig. 82.—Kiva (restored) of the great community house of Tyuonvi (El Rito de los Frijoles), New Mexico. The holes in the cliff were for the reception of beams of construction now lost. (From a photograph loaned by Miss F. Grace Smith.)

earth attending the construction, either by the settling of posts or in more definite excavation (cf. §15). This is especially true in the case of defensive structures, or forts, which are sometimes extensive, and in which the walls were originally formed of palisades of upright logs, set close together. In all such study, however, there is little to attract the eye of the inexperienced, and even structures involving considerable excavation are frequently overlooked, or confused with the surface irregularities caused by fallen trees or the erosion due to brooks. Munro, the Scottish archeologist, has used as a guide in the excavation of prehistoric hut-sites in Scotland and Ireland, the simple character of the ground plan of aboriginal structures. He says:

“My own experience has hitherto taught me to regard prehistoric dwellings as either round or rectangular, or at least near approaches to these figures. We know that forts, and other buildings constructed on hill tops, or on the summit of rocks difficult of access, often assume extremely irregular forms in accordance with the natural contour of the ground. But whenever prehistoric man abandoned his primary places of abode, such as caves and rock shelters, and took to building for himself houses in the open, he invariably adopted the simplest plan of construction, viz., either circle, oval, square, or rectangle, just as the savage still does.”¹

When habitations are constructed of stone, and especially when the site selected has a restricted area, as in the case of a hill top or niche in the side of a cliff, the houses are almost always built together in the form of a complex communal dwelling. Such were the “cities” of antiquity, like the one constructed by Romulus, or

¹ Robt. Munro, “Bosnia, Herzegovina, and Dalmatia,” 1900.



Fig. 83.—A modern Indian pueblo; Tesuque, New Mexico.

like those of classic times in Greece and Palestine. In these countries, in fact, such communal towns are still to be found, each new house being constructed against previous structures, so that the labor of building at least one side wall is spared. "The cities and villages of Palestine, so far as appearance is concerned, vary in size merely. The houses of a small village are often-times just as closely packed as the buildings in a city, so that a village will look like a fragment knocked off a city."¹

Thus is explained an Indian pueblo, in which an archeologist, familiar with classic lands, sees merely the usual primitive form of communal dwelling, an *oppidum*, or perhaps an *acropolis*, in accordance with site (Cf. §25). Our great Southwest, including especially the drainage areas of the San Juan and the Rio Grande, centering at about the point where the four states of Utah, Colorado, Arizona, and New Mexico come together, is thickly covered with the remains of pueblo architecture, and from here the sites spread over the border into Mexico, where the region is still in great part unexplored. The living remnants of the great aboriginal people are gathered into about thirty pueblos, including among the best known communities the Zuni and Hopi. These furnish data of the utmost importance to the student of American ethnology, and offer some explanation of the manners and customs of the pueblo peoples of the past. These seem to have been influenced by the Aztec civilization that developed in Mexico, although there was probably no original connection between

¹ Elihu Grant, in "The Peasantry of Palestine," 1907, p. 43.

either and the Central and South American civilization.

The pueblos of the valleys and mesas are undoubtedly the descendants of the older cliff houses and cliff palaces, now found, long ago deserted, on the walls of the canyons. The similarity of architecture is indicated, among other things, by the long horizontal rows of holes along the face of the cliff, for the reception of the inner ends of ceiling beams. In the modern pueblo the blank side wall of a pre-existing building serves the purpose of the cliff face, and receives the ceiling beams of the new structure.¹

69. *American Architecture; Remains of Temples and Temple-Cities.* It was one of the great disasters of history that the four great centers of aboriginal American civilization, that had developed under the favoring conditions of a tropical climate, and needed only slight aid and encouragement from the culture of Europe to take their place among the great civilizations of the world, should have met, when almost at the goal, not the easy-going French trappers, the shrewd Dutch traders, or even the Puritanic English colonists, but the Spanish *conquistadores*, accompanied by fanatical religious leaders, representing in combination the two worst human passions, lust for gold and propagandist zeal. With no feeling of pity or sympathy concealed beneath either black robe or steel corselet, these invaders were let loose upon the innocent nations, who, inspired by a fatal tradition of white gods with beards who were to

¹ Good illustrations of the cliff-ruins of Tsankawi, N. M., are found in the *National Geographic Magazine*, September, 1909, p. 87.

help and teach them, actually welcomed the intruders and offered presents of gold and treasure.

At the advent of the Spaniards the natives were possessed of majestic temples of carved stone, superb monuments, and public courts; they possessed great treasure in gold and jewels; and had actually recorded their history through forgotten ages in books made of the agave leaf, and inscribed in hieroglyphic symbols stamped by means of movable wooden blocks. Once a Spanish priest penetrating with difficulty into the unknown wilderness, came to a village where "he beheld a venerable man seated under the shade of a palm tree, with a great book open before him, from which he was reading to an attentive circle of auditors the wars and wanderings of their forefathers. With difficulty the priest got a sight of the precious volume, and found it covered with figures and signs in marvelous symmetry and order."¹

Yet, resisting the appropriation of their wealth by the Spanish warriors, these innocent people were slain by thousands; unwilling to discard their national beliefs for the religion of the black-robed European priests, they suffered the tortures of martyrdom. Their temples were demolished; their monuments were overthrown; and their libraries, in part centuries old, and containing priceless annals, were burned in the public squares. "The historian Torquemada asserts that five cities alone yielded to the Spanish governor at one requisition no less than sixteen thousand volumes," of which "every leaf was destroyed."²

¹ D. G. Brinton, "Myths of the New World," 3rd Ed., 1896, pp. 26-27. Quoted from Humboldt, "Vues des Cordillères," p. 72.

² *Ibid.*, p. 25.

After such a thorough campaign of annihilation it might be supposed that nothing could now be learned concerning the native civilizations that sought the help of the Spaniards, but there are still a few data to be found. The ruins of their cities, overgrown with a tropical vegetation, furnish much, especially as these ruins are profusely decorated with hieroglyphic inscriptions; there are still some traditions to be collected from the few native descendants; there are, too, the various spoken languages and dialects, which assist in tracing tribal affinities, and are suggestive concerning former tribal wanderings and intertribal associations; and, lastly, a handful of the agave books have survived and are kept by some of the great museums of the world, as priceless treasures, the Mexican and Maya codices. From all these sources it has been made out that there were, at the time of the discovery, four of these tropical American civilizations, mainly independent of each other—the *Aztec*, the *Maya-Quiche*, the *Chibchan*, and the *Quichua*, the first Mexican, the second centering in Yucatan and Guatemala, the third Colombian, near Bogota, and the fourth Peruvian.

The Aztecs, from their speech, a dialect of the great Nahuau language, show some affinity with the Shoshonean tribes further north (Comanche, Pai-ute, etc.) which suggests northern origin for the entire Nahuau family, and shows the Aztecs to be a tribe that migrated southward, until it came into contact with the Maya-Quiches.

This latter, found mainly in Yucatan and Guatemala, were of a much older civilization than their northern neighbors, the Aztecs, and spoke a totally distinct lan-

guage. At the time of the discovery they were already on the wane, yet their former greatness was attested by the great temple cities even then abandoned, and, from our standpoint, prehistoric. It is these Maya cities that form the great ruins of Central America, which have now for so long attracted the attention of archeologists, yet which still await in great part the spade of the excavator. This great Maya civilization was entirely distinct from the two remaining ones of the four, and is separated by the entire length of the isthmus and more.

The Chibchan formed a small, though independent, center in the heart of Colombia, and were again separated by a long interval from the civilization of the Peruvians. This last contained two distinct subdivisions, the Quichas, with their two tribes, Inca and Aymara, inhabiting the lofty Andean plateau, with its center about Lake Titicaca, and the Yuncas, who occupied the coast regions. The Quichas, who attained the highest civilization among the Peruvians, were not wanting in temples and other stone structures, but their chief peculiarities were their cult of the dead, with embalming and the establishment of necropoles as with the Egyptians, and their extensive use of copper, to which by an art now unknown they imparted a hardness almost like that of steel. They were thus a little beyond the true Neolithic stage, generally characteristic of the Americas, and might more properly be described as virtually in the Bronze Age. In fact, these advanced South American peoples must be technically ascribed to the actual Bronze Age, although in its initial stages, since in some of the copper artifacts more or less tin is found, occasionally up to twelve to sixteen per cent,



Fig. 84.—Ruins of one of the temples at Tikal, Guatemala (Temple V). Each temple is placed on the summit of a lofty artificial mound, in the shape of a pyramid, with stone steps forming each side. This entire city consists of a bewildering mass of temples and palaces, arranged in general in three separate groups, or acropoles. Tikal, evidently not the ancient name, in the local Maya speech signifies "place where spirit voices are heard." (After Tozzer.)

thus making the metal technically not copper but bronze.

The picturesque ruins of Maya cities occur scattered over Yucatan, Guatemala, and a part of Honduras and Nicaragua, buried in such luxuriant tropical vegetation that they are found with great difficulty, and some indeed, may yet remain undiscovered. Not uncommon have been experiences like that of Joaquin Miller in Nicaragua, who

“found a city old,—so old,
Its very walls were turned to mould,
And stately trees upon them stood.
No history has mentioned it,
No map has given it a place;
The last dim trace of tribe and race—
The world’s forgetfulness is fit.
It held one structure grand and mossed,
Mighty as any castle sung,
And old when oldest Ind was young,
With threshold Christian never cross’d;
A temple builded to the sun,
Along whose somber altar stone
Brown bleeding virgins had been strown,
Like leaves, where leaves are crisp and dun,
In ages ere the Sphinx was born,
Or Babylon had birth or morn.¹”

Whether in serious prose one may impute so vast an age to Central America ruins is doubtful, since at the arrival of the Spaniards at the beginning of the sixteenth century, the Maya civilization, although long past its zenith, was yet manifest in a few places, and some of the cities were still inhabited.

¹ Joaquin Miller, “Songs of the Sierras,” 1871, in “With Walker in Nicaragua.”

The first of the ruined Maya cities to attract the general attention of the modern world, were those explored during the middle of the nineteenth century, such as Uxmal (Yucatan), Copan (Honduras), and Palenque (Southern Mexico), but the explorations of the last few years, especially those conducted since 1898 by the Peabody Museum of Cambridge,¹ have revealed a large number of other cities of equal or greater size and grandeur —Piedras Negras, Yaxchilan, Tikal, Loltun, Chacmol-tun, and many others.

Fig. 85 (p. 347) shows a carved stone lintel (No. 26) from the temple at Yaxchilan, Usumatsintla Valley, on the Guatemala side of the boundary. (108x85 cm.) "A woman of rank presents a tiger's head, prepared as a helmet, to the sacrificial priest. The woman has on shoes, her cuffs are of scale work, her tunic (*huipilli*) shows a reticulated pattern, her headdress is of medium size and adorned with conventionalized flowers, her ear-ornaments are very distinct, and a line of small dots borders the lips and ends in a scroll on the cheek turned toward the spectator. Below the face is a necklace of stone beads, with a medallion in front. The woman carries with both hands a tiger's head, with a great plume of feathers, probably meant as a head covering for the priest. . . . A pendant ornamented with tassels hangs from the woman's hands down to the ground. The priest has buskins, leg-bands, and striped cuffs. His

¹ Peabody Museum Memoirs, beginning 1900, Folios, with beautiful photographs. A good account of excavation at a single site is found in Morley's recent paper on the ruins of Chichen Itza, Yucatan, publ. by the Carnegie Institute, Washington, Nov. 1, 1913. This includes an excellent bibliography on Maya sites.

jacket shows a tasteful pattern in lines, and is ornamented with six rayless stars; a broad sash of shell-work reaches from his neck to his knees; the ear ornaments are peculiar. His headdress, with handsomely executed flowers, has a grotesque face on top, and out of the knot at the back falls a plume of feathers. In his right hand the priest holds a sacrificial knife, and his left hand lies against the front of the tiger's head." There is also a short inscription of nine characters, arranged in the form of a T, between the two figures.

Although showing much variation in the ground plan, in accordance with the surface topography, the cities are very similar in general architecture. The extant ruins are mainly those of temples and palaces, arranged about paved courts, or crowning isolated hills, accompanied by monuments erected here and there. The temples and other pretentious buildings are set upon a series of great stone bases, formed like the lower tiers of pyramids, so that the edifices that crown the top are accessible by steps from all directions. The chambers and passage ways are roofed over, either by horizontal beams and architraves, or by the use of pointed arches, high and narrow, with straight sides, like the capital letter A. Occasionally, too, the point is truncated and finished by a short horizontal piece, like the cross-bar of the same letter. The isolated steles are monolithic, with usually two opposing flat surfaces for carving, and are often securely set into the cement that forms the pavement of the plaza or court.

Everywhere, upon convenient surfaces, walls, stelæ, and even steps, there is a profusion of carving, done in an archaic, and often grotesque, style suggestive of



Fig. 85.—After Teobert Maler.

Egyptian and early Greek art (Mycenean). The isolated stelæ are carved, usually upon two opposite sides, with conventionalized human figures, apparently portraits of distinguished personages, who are probably priestly rulers. They are accompanied by heads and other symbols of various deities, expressing their particular allegiance, and in a few cases human victims, alive and bound with cords, lie at their feet. In all cases, on stele or wall or step, the available places, such as the spaces between pictures, are covered with inscriptions, called for convenience glyphs, in the same square form and of the same general appearance as those preserved in the few extant manuscripts. Their variety, however, is endless and thus they seem to be not phonetic symbols, but an elaborate system of pictographs, perhaps given a definite meaning by combining them with certain ideographic signs. In some favored spots, also, as upon the interior walls of chambers, extensive mural paintings are still to be seen.

In all cases time and luxuriance of tropical vegetation have crumbled the stone and forced the joints apart, and unless they are speedily taken care of the destruction of these beautiful ruins is inevitable. The fall of a giant tree that holds in the tenacious grasp of its roots important pieces of masonry may do irreparable damage to the site of a temple or palace, while a forest fire, that often engenders a high degree of heat, especially if followed at once by a rainstorm, while the stone is still hot, might prove the complete destruction of an entire city. In addition to natural forces, however, innumerable human atrocities are ever imminent, especially under the sway of a lax Central American government,

and the gravest dangers are feared by archeologists for the safety of these priceless ruins. In one case a concession of land, which happened to include an important prehistoric city, was given by the government to some native woodchoppers for a few dollars; in another a railroad has been run perilously near an important site, and the inevitable train of unregulated visitors have scraped off precious bits of mural painting "and the clean white space thus made upon the wall has been utilized to inscribe visitors' names and mongrel poetry."¹

Even the native Mayas, although descendants of the race who built the monuments, retain little or no national consciousness, and are dangerous in several ways: some dig in all directions through the ruins, in search of the great stores of gold and treasure which they believe to be buried there; others fear the magical power of the effigies carved upon the steles, and render them harmless by the simple and childish device of obliterating their faces. It is thus with pleasure that we here record the praiseworthy efforts of at least one enterprise to clear and preserve intact these priceless ruins. The United Fruit Co. has recently acquired some land in Guatemala, within which is situated the city site of Quirigua, a typical ruin. This site the Company, at the suggestion of its local manager, Mr. Victor M. Cutter of Porto Barrios, has set apart for a permanent park, and intends to free the ruins from their load of tropical vegetation, to have them thoroughly excavated and kept

¹ Edw. H. Thompson, in *Memoirs, Peabody Museum*, Vol. 3, No. 1, p. 10.

from further destruction, and eventually to render the site accessible for visitors and students.

This work is now well under way, under the management of Mr. Edgar L. Hewett, aided by the St. Louis Society of the Archeological Institute of America, who have already published the report of Mr. Hewitt's work for the first two years of the undertaking (1910, 1911).¹ Quirigua will probably thus become for some time the most available site for the study of the prehistoric civilization of Central America, yet it is to be hoped that either the local governments, or the enterprise of private societies and individuals, will in the near future subject the other important sites to a similar treatment.

70. *American Graves.*—Among many tribes of the American Indians the cult of the dead was well developed, and in those cases in which the body was placed in a grave or tomb the most valued possessions of the deceased were frequently buried with him.² During the summer of 1913 an important aboriginal cemetery was unearthed at Burr's Hill in Warren, R. I., the Indian "Sowwams," chief town of the Wampanoags. This cemetery, as dated from the associated objects, covers the trade period with Europeans in that place, and ends, naturally, with the death of King Philip, their leader, and the flight of the tribe (about 1600-1676). Great

¹ Edgar L. Hewett, "Two Seasons' Work in Guatemala." *Bull. Archeol. Inst. Amer.*, June, 1911. Cf. also a paper by Neil M. Judd, in *Amer. Anthropol.*, Vol. 17, 1915, pp. 128-138, with account of the work of making plaster casts of works of art at Quirigua.

² For a recent summary of methods of burial among the North American Indians, cf. David I. Bushnell, Jr., "Native Cemeteries and Forms of Burial East of the Mississippi," as Bulletin 71 of the Bureau of Amer. Ethnology, 1920.

quantities of kettles, spoons, knives, beads, pipes, swords, and guns, as well as numerous other objects, were obtained, all of English, French, and Dutch manufacture, besides much native wampum and pottery. Generally there was a quantity of red pigments, in powder or lumps, and the few pieces of dried skin found showed that this same pigment had been used in some cases to cover the body of the deceased.

Allowing for the new elements in the objects found, introduced by trade with Europeans, the graves found at Warren correspond exactly to the descriptions of the older graves excavated on Cape Cod (Truro) by the Plymouth Pilgrims in November, 1620, while the Mayflower lay in the harbor at Provincetown. One of the excavators, probably William Bradford, gives the following account:

“and as we came into the plaine ground, wee found a place like a graue, but it was much bigger and longer than we had yet seene. It was also covered with boords, so as we mused what it should be, and resolved to dig it vp, where we found, first a Matt, and vnder that a fayre Bow, and there another Matt, and vnder that a boord about three quarters long, finely carued and paynted, with three tynes, or brooches on the top, like a Crowne; also between the Matts we found Boules, Trayes, Dishes, and such like Trinkets; at length we came to a faire new Matt, and vnder that two Bundles, the one bigger, the other lesse. We opened the greater and found in it a great quantitie of fine and perfect red Powder, and in it the bones and skull of a man. The skull had fine yellow haire still on it, and some of the flesh vneconsumed; there was bound up with it a knife, a packneedle and two or three old iron things. It was bound up in saylor’s canvas Casacke, and a payre of cloth breeches; the red powder was a kind of Embaulment, and yeelded a strong,

but not offensiuе smell, it was as fine as any flower. We opened the lesse bundle likewise, and found of the same Powder in it, and the bones and head of a little childe, about the leggs, and other parts of it was bound strings, and bracelets of fine white Beads; there was also by it a little Bow about three quarters long, and some other odd knackes; we brought sundry of the pretiest things away with vs, and covered the Corps vp again. After this, we digged in sundry like places, but found no more Corne, nor anything else but Graues: There was varietie of opinions amongst vs about the embalmed person; some thought it was an *Indian* Lord and King: others sayd, the *Indians* haue all blacke hayre, and never any was seene with brown or yellow hayre; some thought it was a Christian of some speciall note, which had dyed amongst them, and they thus buried him to honour him; others thought, they had killed him, and did it in triumph over him.”¹

This early account of the archeological investigations by the New England Puritans reveals them as very much like their present descendants, and showing some true scientific interest in their red brothers, although, perhaps, not a wholly sympathetic one. We certainly share with them their doubts concerning the body with the “fine yellow hayre,” as we are prevented from considering it simply faded, as sometimes occurs in old graves, by the evident recency of the burial with “some of the flesh unconsumed.” Their surmises concerning this problematic body have been shared by all later commentators, but there is not the least doubt concerning the aboriginal nature of the graves in general, and their condition. As in this excavation by the Puritans, great masses and lumps of a similar red powder, undoubtedly

¹ “Mourt’s Relation,” first paper.

a paint or pigment, were found in the graves excavated at Warren, R. I., in 1913, and in at least one case an extensive portion of skin from one of the bodies was found dried, and covered with this paint, which seemed to have acted as a preservative. This red powder is often characteristic of aboriginal graves, as was found recently during the excavation of graves in Maine. In many of these, where all traces of bones and teeth had long disappeared, the indestructible red powder was frequently found in abundance.

In aboriginal interments the body was seldom if ever placed in the grave in an extended position, but was folded up in some more or less natural position. Rarely, as was often the case with the more distinguished dead, the body was placed in a true sitting position, but this is usually a journalistic phrase, and adapted to express any of the many possible folded positions. A common position for western Massachusetts was a folded or flexed one, the body lying on the right side, with the knees to the chin, and the arms placed together with the hands in front of the face. There is often a more or less universal custom locally to place all bodies in a similar orientation to the points of the compass, and in excavation this point should always be carefully noted, but even when a certain position seems the rule, there are likely to be many exceptions.

Concerning the probable reasons for folding aboriginal bodies, the similar customs still in use among other primitive peoples, are very suggestive. There may be only the utilitarian idea of putting the body into as small a compass as possible to avoid digging a large hole; there are also frequently found definite ideas connected

with certain religious beliefs. Of these the most general seems to be some idea of the possible possession of the body by an evil spirit, which, without a body, naturally cannot do very much harm. For this very reason it is plain that such a spirit seeks to enter a recent body in order to accomplish his purposes, and it is the desire of the friends of the deceased to prevent such action. Consequently it often becomes the custom to bind and tie up a body as soon as life departs, as a preventive of its later possession, and the bones of such a bound body, long after the decay both of the flesh and of the leathern bonds, would be in just the position as is actually the case.

With an aboriginal body certain objects, like the weapons or other personal utensils, or the food bowls or other dishes, are frequently placed, and thus a grave, even when the bones have long since disappeared, is often a fruitful source of valuable objects.

Quite aside from interment in the earth, the other forms of the disposal of the dead, like suspension of the body upon the bough of a tree, burial of the whole body or of its dismembered portions in an urn, occur in various parts of America. Cremation does not seem to have been practiced in the New World.¹

71. *Mounds, Funereal and Commemorative.*—A mound in the sense of a raised hillock of earth more or less regular in shape and raised above the surrounding surface, may be the result of various causes. It may be due to agencies other than human, as the so-called

¹For a general synopsis of the mortuary customs of the North American Indians, cf. Yarrow, in *Annual Reports of the Bureau of Ethnology*, Vol. 1.

“tree-mounds,” resulting from the uprooting of a great tree, and the subsequent deposition of the earth and stones held by the roots; or, again, it may be connected with human activities although produced quite unintentionally, as in the case of wind-blown sand heaped over the ruins of an abandoned pueblo or town site. Such city mounds, or *tells*,¹ are seen by hundreds in the plains of Mesopotamia, and similar ones occur in great numbers in the northern part of Mexico.²

Distinct from all such are mounds intentionally constructed by the hand of man, and of these there are many kinds, corresponding to a variety of purposes. Some may form a part of a system of defensive earthworks, or be erected as the foundation of some other structure; others are funeral or commemorative, that is, tombs or monuments.

The development of a funereal mound as a grave for a single individual may receive at least a partial explanation from the custom yet practically universal over large portions of China. In this latter country the dead are not buried, that is, inhumed beneath the surface; but the coffin, often a ponderous affair, is placed somewhere in a field or on the ground at the base of a city wall, and covered, perhaps with a straw thatch, a tiled roof, or eventually surrounded by a brick wall, built close about it. As a second stage, which may occur months, or even years afterward, the earth is heaped around and above the entire structure, and forms a more or less pretentious mound.

¹ Arabic word, used throughout Mesopotamia to designate such structures.

² Cf. Carl Lumholz, “Unknown Mexico,” 1902, Vol. 1, Chap. IV.

Many of the mounds of artificial origin, which occur all over North America, and especially in Ohio and Wisconsin, betray upon excavation a structure similar to these recent Chinese ones: a mound of earth, and at their core a single skeleton, often enclosed in a stone cist or

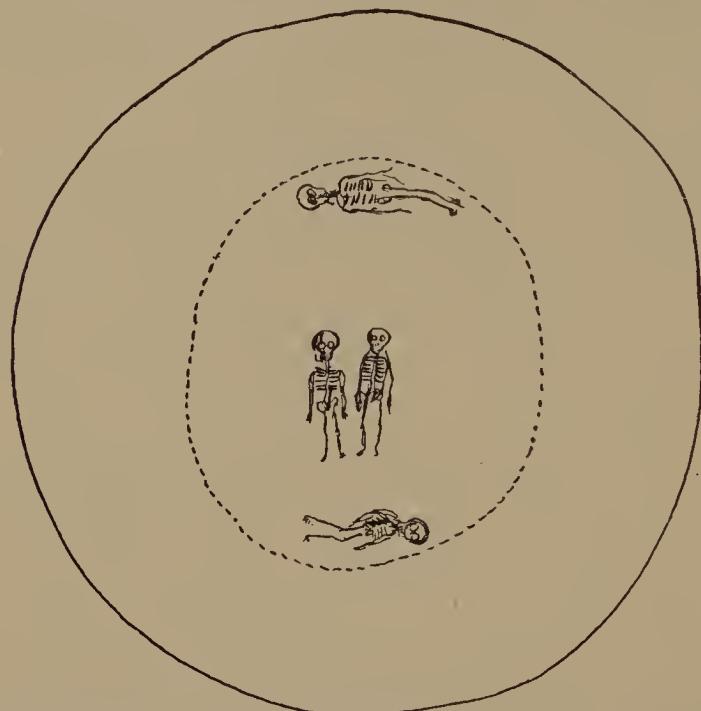


Fig. 86.—Mound at Prairie du Chien, Crawford Co., Wisconsin. Here several bodies were laid together in a slight central depression, and the mound erected over them. (After Thomas.)

tomb chamber of some sort. The matter is often rendered at first sight more complicated by the presence of other aboriginal skeletons, placed irregularly over the surface, and evidently due to the intrusive burial, often centuries after the erection of the original mound, of other bodies, whose friends sought the spot either from

the supposed sanctity of such places, or because of the more utilitarian advantage of digging in a spot of soft soil.

When actually excavated, such mounds reveal their purpose as tombs of the dead (tumuli) by the presence



Fig. 87.—The Gallaway Mound, Munroe Co., Tennessee. Here there is a special chamber, defined by a circle of stones, but without roof or floor, in which were four skeletons. The rest, ten in number, were outside of this circle, but still beneath the middle portion of the mound, and at the same level as the rest. They are thus contemporary with the enclosed ones, and not the result of later intrusive burials. (After Thomas.)

in the center of one or more bodies, the position of which is directly related to the position of the mound, forming its core. In the simplest cases the body, or bodies, were laid either flat upon the ground or upon the floor



Fig. 88.—Mound in Allamakee Co., Iowa. Within this is a stone chamber, enclosing a seated skeleton, surrounded by vases and other utensils. (After Thomas.)

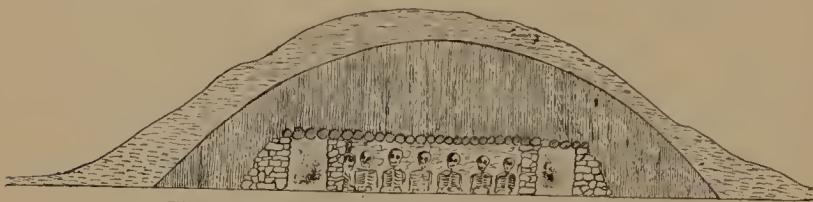


Fig. 89.—Vertical section through the central axis.

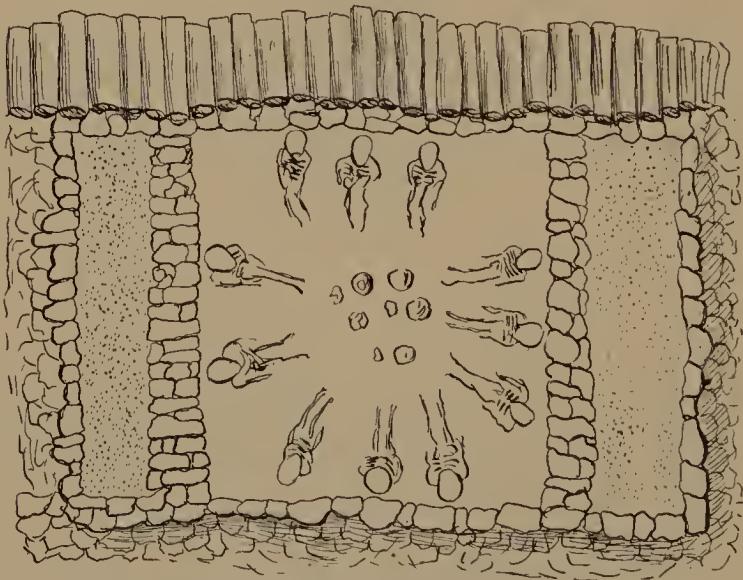


Fig. 90.—Ground Plan.

Two plans of a mound in Jo Daviess Co., Ill., 10 feet high, and 65 feet in diameter. It contained a crypt 13 by 7 feet in ground plan, with an inner chamber 7 feet square. This contained eleven seated skeletons.

of a shallow pit, and the mound piled directly upon them (Fig. 86); or perhaps a large part were thus treated, while a few, evidently the more eminent personages, were partially protected by rings of stones (Fig. 87). In other cases the stone protection becomes a complete cist, or coffin, or an elaborate tomb chamber, within which the dead were laid, surrounded by their possessions, in the form of pottery or stone implements. (Figs. 88-90).

Mounds of these various types occur in many parts of the United States; so generally distributed, in fact, that in a recent map of mounds in this country east of the Mississippi, the one territory adequately studied in this respect, the only states in which mounds have not been found thus far are Vermont and Delaware. While few and scattered along the Atlantic slope, except for a small territory in Florida, they occur in profusion in the Central Eastern states, that is, Wisconsin, Michigan, Illinois, Ohio, Kentucky, and Tennessee. Wisconsin possesses, almost exclusively, the singular type known as *elongate mounds*, in the form of long ramparts, and shares with Ohio the possession of the so-called *effigy mounds*, with outlines in the form of various animals; turtles, serpents, or birds with outspread wings. Other than in shape, however, these singular mounds are not different from the rest.¹

Concerning the builders of the mounds, later investigation has found nothing in support of the older view, widely diffused in school textbooks and in popular writ-

¹The most extensive work upon the mounds of the U. S. is that of Cyrus Thomas, "Burial Mounds of Northern United States," in B. of Ethnol., 5th Ann. Rep., 1883-84.

ings, that they were the work of a race other than the modern Indian. The skeletons thus far found are of Indian type, and certain mounds have been erected quite within historic times, or within the tribal memory of the Indians themselves. In the writings of the early missionaries and explorers, also, there is abundant evidence of the causal association of Indians with mounds.

Some of the most extensive mound formation in the United States occurs in certain parts of Ohio, such as the Scioto Valley at Chillicothe and the Muskingum Valley at Marietta. At such sites there occur various types of earthworks, ramparts, platforms, and simple mounds, the ground plans of which suggest the former presence of something like a city, which, in the time of its culmination, covered with such superstructures as the Indians were able to build, must have made an imposing appearance. At Marietta, for instance, on a level plain at the juncture of the Muskingum with the Ohio, the first white settlers saw a series of pretentious earthworks, which, judging from contemporary paintings and other sketches, consisted of raised embankments in the form of two great squares and a large mound, surrounded by a moat; also from the middle of one side of the larger square ran two long walls parallel with each other, evidently forming the sides of a broad avenue leading away from the square, and suggesting a *via sacra*, or path for ceremonial processions. The idea is still further suggested by the great flat platforms, or temple foundations, placed within the larger square.

The present city of Marietta is practically coincident with this pretentious site of the aborigines, and the

earthworks are mostly leveled or built into streets. The largest of the "temple sites" is now used for the new city library, which insures its preservation, and the great mound had its perpetuation secured by selecting the surrounding land as the site for the modern cemetery. This mound is thirty feet in height, and one hundred and fifteen feet in diameter, beyond which is a moat fifteen feet wide and four feet deep, with an external enclosing rampart outside of this. On one side the mound is provided with a flight of modern steps, ascending to a flat area on the top, where are placed several seats for the accommodation of visitors.¹

72. *American Petroglyphs and Other Form of Writing.*—The generic word *petroglyph*, signifying any carving executed upon stone, is used more especially to mean something carved in such a way as to impart information—in a broad sense, an inscription. Such *petroglyphs*, which consist in part of definite, clearly recognized pictures, and in part of lines of unknown significance, occur throughout the United States, engraved, sometimes upon the sides of cliffs and large boulders, sometimes upon smaller slabs and stones. A typical *petroglyph*, and one which has become historic, in the sense of having been much exploited, visited, and written about, is the famous Dighton Rock, near Fall River, Mass. For a time, when American archeology was in its infancy,

¹ For a description of this site, as well as many others, the classic authority is Squier and Davis, "Ancient Monuments of the Mississippi Valley," Smithsonian Institution, 1847. This is provided with numerous maps and ground plans. The volume forms the first number of the "Smithsonian Contributions to Knowledge," and is a worthy beginning volume from an institution that was then in its infancy.

this rock was brought into connection with a partially armored Indian skeleton found in the neighborhood, "the Skeleton in Armor," and also with a stone mill belonging to one of the early white settlers of Newport, and probably built by him; and the whole series of objects, taken together, were considered to be the remains



Fig. 91.—A recent photograph of the famous Dighton Rock, as it lies in the Taunton River, exposed at high tide. (From a photograph loaned by E. B. Delabarre.)

of an early Scandinavian colony. This, under the leadership of one Leif Eriksen, came to some unknown countries in the west about the year 1000 A. D., and one of these, called in the saga "Vinland the Good," has been doubtfully identified with the shores of Massachusetts or Rhode Island. The Dighton Rock inscription is, however, mainly Indian, with later additions, and shows

the typical style characteristic of aboriginal pictographs.¹

Although there has been as yet no great success in reading or understanding these inscriptions, some light is shed upon the subject by studying the devices and inscriptions of our modern Indians, who are able not only to make such writings, but to tell us what they mean by them, and how they are read. This picture writing of the present time is wrought upon birch bark or the lower side of buffalo hides, worked into the decorative patterns of baskets or wampum belts, or even tattooed into the skin of their own bodies. From such studies it may be deduced: (1) that the American aborigines made no attempt at phonetic writing, that is, the representation of definite vocal sounds by conventional characters;² (2) that their main attempts at expressing thoughts were by means of pictures that portrayed actual events, or represented an idea; and (3) that certain of these symbols, often used, became highly conventionalized and obscure, and required to be learned individually to give any meaning. Many of these obscure signs, however, probably represent a natural development from an older form in which a definite picture was apparent, and which, losing lines and curves as it be-

¹ For a critical historical study of the Dighton Rock, and especially the psychology of those who have investigated it, cf. the exhaustive papers of E. B. Delabarre. These are (1) "Early Interest in Dighton Rock," Cambridge, Univ. Press, 1916; (2) "Middle Period of Dighton Rock History," *ibid.*, 1917; (3) "Recent History of Dighton Rock," *ibid.*, 1919. These papers were issued as Publications of the Colonial Society of Massachusetts.

² Students of Central American archeology are inclined to find traces of the use of certain symbols as representatives of definite sounds, and thus be truly phonetic.

comes frequently made, in time comes to be represented by but a few lines of the original picture, and these highly conventional. Such a character would in time pass through the stage of being an actual picture (*pictograph*) and become a symbol or sign (*ideograph*), meaningless to anyone ignorant of the past history through which this symbol has gone.

Still another principle may be considered in connection with the writings of North American Indians, and that is the high development of the gesture language. This consists of an almost countless number of positions and actions of the arms and hands, by means of which an elaborate and often detailed conversation may be carried on by parties at a distance; and since the signs were the same over a wide area, and among different tribes, this form of language could be used equally well where the spoken tongues of the two parties were mutually incomprehensible. If, now, an Indian attempted to record certain definite ideas upon a stone or piece of leather, it would often occur to him to make a picture, not of the idea itself, but of the particular gesture of arms and hands which gave everywhere the same idea, and there would thus arise a character which, even while still in the picture stage, would convey no meaning to a European scholar.

The above principles may be illustrated, and the psychology of Indian writing be explained, by a few illustrations taken from two common forms of native literature, *winter-counts* and *mnemonic songs*. The former, kept by the wise men of the tribe, were a sort of calendar to record the tribal annals, and in the case of a man who began as a young man, or whose memory was

to be trusted, and who eventually lived to a ripe old age, might extend over a long period. As the years had no consecutive numbers, and dated from no definite event, they were designated, in the mind of the recorder, by the characteristics of each winter, or by some marked event that took place during this season, and these characteristics were rerecorded, usually upon the inner side of a tanned buffalo hide, by means of symbols.

In spite of the strongly individual, and often local, nature of such records, one made by a man of influence would be known to the Indians over a large territory, and used by them as a calendar. Thus the winter-count of Lone-Dog, which extended over seventy-one winters, beginning with that of 1800-1801, "was known to a large portion of the Dakota people."¹ This particular record is painted upon a buffalo skin, with the symbols placed in the form of a spiral, beginning at the center; and as usual, each symbol represents a winter, and records an event by which it was rendered memorable. Thus, for the first winter (1801-1802), the symbol given means "thirty Dakotas were killed by Crow Indians." There is here no sign for Crows, which is intended to be remembered, but a long black mark always signifies the death of a Dakota. The sign for the second winter signifies "Many died of smallpox," and is a sufficient record of the disease, especially in the natural colors, with the blotches in red, but gives no symbol for "many," which

¹ Col. Garriek Mallory, "Picture Writing of the American Indians." BM. of Ethnol., 10th Ann. Rept., 1888-89, p. 266 *seq.* This work, which occupies an entire volume, is of the greatest importance, for the subject of Indian inscriptions of all sorts. Lone-Dog's buffalo robe, with the winter-count painted upon it, is here given in color.

again is to be remembered. The horseshoe for the third winter signifies "A Dakota stole horses with shoes on," and the fourth winter, "They stole some curly horses from the Crows," is for them sufficiently indicated by a horse covered with black spots.

Often, however, the symbol was more obscure, as in the symbol for the winter of 1810-11, "Black-stone made medicine." For this one must first know that a buffalo's head is very important in the "making of medicine,"



Fig. 92.—A "winter-count," or Indian calendar, which has a separate sign for each winter, recording some signal event that, to the maker of the count, has seemed of sufficient importance to be used to designate that particular season. This is a fragment of the winter-count of Lone-Dog, a Dakota Indian. The original was painted in a spiral upon the inside of a buffalo-hide. The figure is explained further in the text. (After Mallory.)

i.e., the conducting of important incantations, and then must recognize as such the curious object attached in an inverted position to the head of the medicine man. Lone-Dog, as it seemed, used no designations to mark the various men who appeared in his inscription, but in certain other winter-counts that was done by attaching a symbol representing the name to the head of the figure.

The winter, as a whole, when spoken of, was desig-

nated throughout the area which employed a certain winter-count by a compound word giving the characteristic of that season. Thus, in the winter count of Baptiste Good, a Boulé Dakota, which included almost the entire eighteenth and nineteenth centuries, and naturally required several successive annalists, the symbols for the first ten winters were to be read as follows:

- 1701-02 The-three-killed-who-went-fishing winter
- 1702-03 Camped-cutting-the-ice-through winter
- 1703-04 The-burying winter
- 1704-05 Killed-fifteen-Pawnees-who-came-to-fight winter
- 1705-06 They-came-and-killed-seven-Dakotas winter
- 1706-07 Killed-the-Gros-Ventre-with-snow-shoes-on winter
- 1708-09 Brought-home-Omaha-horses winter

These are hardly to be designated as "the annals of a quiet life!" On the contrary, the hardships of primitive life are frequently but too evident, as in 1720-21, "Three-lodges-starved-to-death winter," or in 1722-23 "Deep - snow - and - only-tops-of-lodges-visible winter." These events were occasionally interspersed with a thrilling encounter, like the somewhat unchivalrous one of 1729-30, "Killed-the-Pawnees-encamped-alone-with-their-wives winter," or that of 1773-74, the "Killed-two-Pawnee-boys-while-playing winter." The winter of 1791-92 was hardly an exciting one, the most noted event being recorded in the title, "Saw-a-white-woman winter."

A mnemonic song was inscribed, usually upon a scroll of birch bark, and was used by the priests during their elaborate ceremonies as an aid to the memory. The ritual was, of course, carefully memorized, but upon the

document in question a symbol stood for each line, and suggested its meaning. It was thus much as though a child, who was to recite at a public gathering some well-known poem, should aid his memory as to both the sequence and the contents of each stanza, by drawing a little picture illustrating them in order, and should hold it before him when reciting. Thus in a certain chant of the Ojibwa (Chippewa) Indians, at a certain point in the ceremony, the shaman says:

“When I come out the sky becomes clear,
The spirit has given me power to see.
I brought the medicine to bring life.
I, too, see how much there is.
I am going to the medicine lodge
I take life from the sky.
Let us talk to one another
The spirit is in my body, my friend.”

As he says this, he looks at a certain part of his scroll of bark, upon which are painted the following eight pictures, each illustrative of one of the above lines. The first of these is a sacred otter skin, the use of which brings a clear sky. In the second the priest is seated upon a mountain, communing with the god Manido. The third represents the thunder bird flying up and entering the sky, not a very obvious connection with the lines to be remembered, and the fourth is still more obscure, but suggests again the idea of seeing from a mountain. The fifth is a leg going to the lodge, and in the sixth an arm is reaching up toward a sacred shell, while the mysterious power of life is shown by a zigzag line, perhaps suggestive of the lightning. No. 7 is obvious, if we understand by the circles simply the location of the two

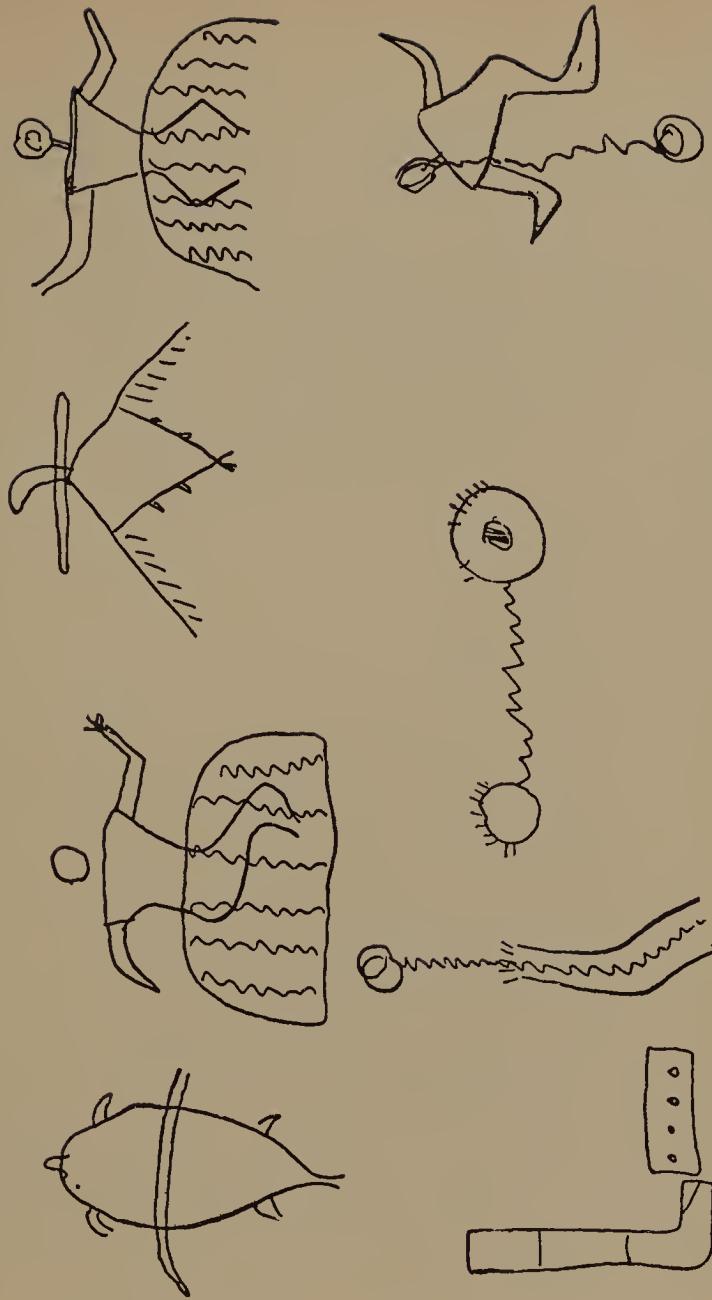


Fig. 93.—Quotation from an Ojibwa mnemonic song, used by the priest to assist him in recalling his ritual. The passage represented here is explained in the text. (After Mallory.)

speakers, and in No. 8 the spirit, by means of these same wavy lines, is entering the head of the priest.

It is through the study of such inscriptions, the meaning of which is still remembered by certain individuals, that one may at least get an idea that the various petroglyphs—although perhaps their original interpretation may never be recovered—may yet have had an actual and very definite meaning for the people for whom they were originally carved. Often, indeed, where the pictographic character of the inscriptions is still preserved, they seem to tell a definite story, with numerous details; in other cases the pictures have given place to idiographs, and the meaning is correspondingly obscured.¹

Geographically, pietographs are spread over both Americas. They are reported, sometimes in considerable numbers, from Canada, from nearly every state of the Union, from Mexico, and the republics of South America; also from the West Indies. In most localities, they are crudely conceived and roughly executed, as in those here figured, but in association with the higher civilization of tropical America, especially that of the Mayas, they developed, on the one hand, into decorative

¹ Some extremely interesting attempts at the interpretation of certain pictographs found in Rhode Island have recently appeared from the pen of Professor E. B. Delabarre. One treats of an inscription on a stone axe, possibly once a signed possession of the renowned King Philip; the other a rock carving interpreted by the aid of the phonetic alphabet of George Guest, a Cherokee, but given in the Wampanoag language. R. I. Hist. Soc. Coll., Jan., 1920. A small boulder, covered with inscriptions, a typical pictograph, from Wrentham, Mass., was described by the present author in the *American Anthropologist*, Vol. 13, 1911, p. 65-67. It is the picture given here. (Fig. 94).



Fig. 94a.—Indian inscription carved upon a small boulder of trap rock, weighing about 30 pounds, and found near "Joe's Rock" in West Wrentham, Mass., about the year 1840. Two photographs of the boulder.

figures in relief, and on the other, into a system of square characters known as *glyphs*, the one leading toward pictorial art, the other toward a more definite form of writing. These two forms occur in close association over most of the available surfaces of the temples and palaces, and are especially abundant upon the isolated steles or columns. These inscriptions and figures carved in relief upon stone edifices are almost or



Fig. 94b.—The inscription transcribed directly from the boulder shown in Fig. 94a, made by the author.

quite identical with those found in the few parchment books still preserved, the *codices*, and in attempting an interpretation the two may thus be considered together.

73. *Central American Glyphs and Codices*.—In studying the ruins of the great Maya-Quiché civilization, and to some extent also that of the Aztecs to the north of them, one is struck with the detailed account of the people, their lives and their customs, depicted

in their sculpture. Everywhere, upon every available place, lintels, side-walls, and even, in some cases, the flights of steps, the surfaces are covered either with reliefs, representing priests, gods, conquerors, suppliants, and beneficiaries, or with rows of grotesque characters called *glyphs*, arranged in squares and undoubtedly forming some sort of inscription. Especially profuse are the carvings upon the isolated monuments, or *stelæ*, which were evidently mortuary and commemorative in character, and set forth the mighty deeds and great wisdom of ancient leaders.

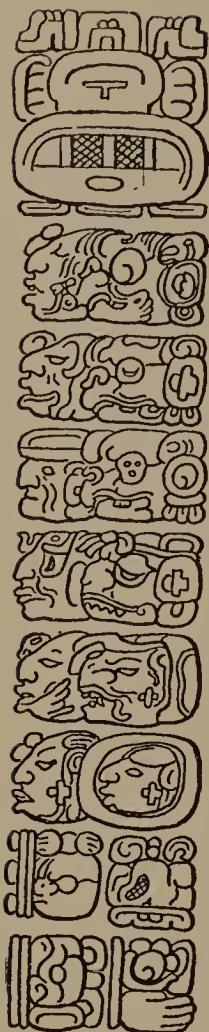
Yet, as the extant ruins are those of temples, palaces, and public squares, while the simple bamboo huts of the people have perished, so also do these unsculptured records concern themselves mainly with the gods and great human personages, while we catch only an occasional glimpse of the rank and file mainly in the guise of suppliants or sacrificial victims. The Maya civilization was a complete hierarchy, as splendid as that of ancient Egypt, and the stone records show noted priests resplendent with decorations and clad in costly robes, yet too often with cringing suppliants at their feet. Thus, at Yaxchilan (Usumatsintla valley, South Mexico), series of monumental stelæ encircle the temples, and present two flat sides for reliefs: the one turned toward the temple displays the figure of a god, the other that of a priest or warrior, without much doubt the personage for whom the monument was erected. Before each side was usually an altar, and as similar altars are pictured upon the reliefs, in association with human victims, there is little room for doubt that the real ones were employed, at least occasionally, for the same purpose.



Fig. 95.—Stele from Quirigua, covered with glyphs. (After Morley.)

Often, too, the priests bear idols or other saered objects in their hands, the latter suggestively similar to the "medieine bundle" of many North American tribes, used in their frequent eeremonials. An object of great reverence singularly enough, was the cross, of quite the same proportions as the usual Christian emblem, but with a tuft of plumes, or perhaps conventionalized branches, growing from the top of the upright. This emblem is frequently seen in the hands of the priest, who grasps it by the upright, below the cross bar, and is so suggestive of Christian rites, especially when thus grasped, that an early eonneetion with Christianity might seem at first glanee almost proved. Yet, on the other hand, this emblem is not unlike those used in Indian eeremonials at the present time, and must of course be considered as having arisen independently of Christianity. At least one monument, too, gives a sly hint of the origin of the conventional deities, at least of their apparition among men, for it reveals such a god, with the robes of dignity and all the emblems and symbols, in the aet of removing a fierce-looking, quite impossible and grotesque mask, and revealing behind it an ordinary human face, strikingly like that of a Maya priest.

The glyphs, square in outline, are placed in rows, either horizontal or vertieal, and ooccupy at times the entire surface of a lintel or side of a stela; at others they fill the otherwise plain background left around and between the figures. Eaeh glyph is a eomplex and intricate carving, sometimes extremely so, in which are embodied grotesque human profiles, arms, and hands; writhing serpents; conventionalized figures, circular,



A



B

Fig. 96.—Outlines of glyphs from Palenque.

(a) From the temple of the Foliated Cross. (b) From the temple of the Sun. (After Morley.)

oval, or elongated—the whole presenting such a bewilderment of scrolls and curves that one looks in vain for the exact repetition of a single character.¹

“The first real advance in interpreting the Maya writing seems to have been made by Professor Ernst Förstemann of the Royal Library of Dresden, who in the decade from 1880-1890 published a number of studies on a Maya hieroglyphic manuscript in the Royal Library at Dresden. Using Landa’s values for the day and month signs, Förstemann finally worked out the basic principles of Maya chronology, and in 1887 he announced the fundamental discovery that the long numbers of the Dresden Codex designate particular days in Maya history, and are all counted from the same starting point, a sort of Maya Birth of Christ as it were.”

Mr. Joseph Thompson Goodman, “after twelve years of patient laborious research gradually won his way into the general meaning of the Maya writing and demonstrated that at least one-half of its two hundred odd characters deal with the counting of time in one phase or another, *i.e.*, chronological and astronomical data expressed in an arithmetic system and notation of great ingenuity and exceeding accuracy.”²

There still remains a large mass of glyphs which are neither calendric nor astronomical in meaning, and, as

¹ For suggestions for the interpretation of the glyphs, cf. Thomas, “Mayan Calendar Systems.” Part I, Ann. Rep., B. of Ethnol., Vol. 19, Part 2, 1897-98; Part II, Ann. Rep., B. of Ethnol., Vol. 22, Part 1, 1900-01. Bulletin No. 28 of the Bureau of Ethnology (1904) on “Mexican Antiquities,” is practically filled with papers on the glyphs and their possible meanings by Förstermann and Seler, the founders of the study. A more recent work, giving the results of our knowledge up to 1915, is that of Sylvanus Griswold Morley, published as Bulletin 57 of the Bureau of Ethnology, Washington, 1915, and entitled “An Introduction to the Study of Maya Hieroglyphics.”

² The two above quotations are by Sylvanus Griswold Morley, in *Amer. Anthropol.*, Vol. 21, 1919, p. 443.

they follow a given date, may well be the details of what happened upon this date.

Although but little progress has yet been made toward an interpretation of this extraordinary method of recording thought, a few points have become fairly well established and should be kept in mind.

1. The inscriptions are mainly calendar records of the passage of time, the enumeration of the years as related to certain great events. In this way they may be perhaps extensions of the "winter-count" system explained a few pages back. As such glyphs must consist largely of numerals, perhaps also of symbols which stand for the names of noted personages or for the gods, and as these are probably not phonetic, there is little likelihood that the personal names may ever be recovered.

2. Each elemental picture used for the purpose of expressing a definite idea possesses but one essential characteristic, often a single line or curve, while all the rest may be varied in accordance with the ability or caprice of an individual writer or carver. Thus the profile heads appear to be mostly digits, in which, not the expression, or any especial characteristic of the face, determines the meaning, but some little point, like the cross over the eye, or a plug through the ear.¹

As a suggestion of the way in which these Maya inscriptions might read, if they could be interpreted as was doubtless done by their contemporaries, who remembered the arbitrary meaning of numerous signs, we still have a few Mexican annals, written down in Spanish at the time of the conquest, or immediately after. Such,

¹ After Morley, p. 97.

for example, is the "Cakchiguel Calendar," which, although employing a calendar system a little different from that of the Mayas, may yet be taken as an example of the style of these annals. Quotations from this are as follows:

"The day of the revolt was appointed by this chief, Cay Hunahpu, and on this day, 11th Ah, the revolt broke out."

"One year less ten days after the revolt was hanged the chief orator Ahmoxnay on the day 11th Akbal."

"The day 8 Ah completed the 14th year after the revolt.

The day 5 Ah completed the 15th year after the revolt.

The day 2 Ah completed the 16th year after the revolt.

The day 12 Ah completed the 17th year after the revolt.

The day 9 Ah completed the 18th year after the revolt.

On the day 3 Caok the doves passed over the city of Iximche, . . . 100 days after the doves had been seen the locusts came . . . on the day 1g."

"On the 10th Ah was completed the 35th year after the revolt. Forty days were lacking to complete three years from the date of the submission of the kings, when Belehe Qat died . . . on the 7th Queh."¹

The Mexican manuscript books, or *codices*, are of the same sort described by the early Spanish explorers, and were destroyed by thousands during the fierce religious propaganda conducted by the Jesuit missionaries. A very few of these survive in American and European museums, and have been the subject of much study and research.²

¹ Quoted from the translation by Brinton, 1885, "The Annals of the Cakchiquels," by Cyrus Thomas, in 22nd Ann. Rep., B. of Eth., 1900-1901, pp. 275-277.

² Cf. the facsimiles of the various codices published at the expense of the Due de Loubet, and explained in detail by Dr.

These manuscripts were written upon long strips of sheepskin, made by piecing a number (15 to 20) of separate pieces together. Instead of being rolled, they are folded back and forth, and bear a thin board at each end, so placed that when the folding is complete the two boards coincide and form the covers. The surface of the skin is covered by a very fine stucco, and upon this surface the pictures and symbols are painted in bright colors. The few extant codices have survived as if by miracle, and have run a hazard. Thus the Codex Borgia, now in the Vatican Library, belonged to the Italian family of the Giustiniani. In the seventeenth century it was given to some children by servants, under the impression that it was a book of comic pictures, and was rescued from them only after considerable mutilation had taken place. Through Cardinal Staphano Borgia it came eventually to the Vatican. The Dresden Codex can be traced back only to 1739, when it was discovered at Vienna. It had been probably in the family of some Spaniard who had traveled in Mexico. Codex Vaticanus No. 3773 reached the Vatican Library about the year 1570, but its earlier history is wholly unknown.

Concerning the contents and meaning of these remarkable Mexican books there seem to be at least two kinds: first, annals, like the carved glyphs of the Maya ruins, and second, religious formulations concerning the gods, and the calendars, used for purposes of divination and for casting horoscopes. The first sort, to which the Dresden Codex belongs, is the more interesting.

Eduard Seler; also the various papers on Maya and Mexican calendar systems, numerals, etc. (in Ann. Rep., B. of Eth., 3, 5, 16, 19, 22; Bull. of Eth. 18 and Ann. Rep., Smithsonian Inst., 1903).

den Codex belongs, contains, among pictures of gods with their symbols, characters like the glyphs, many of which may be read as numbers. In the second sort, of which both Codex Borgia and Codex Vaticanus 3773 are typical examples, are set down the gods ruling the days and hours, their attributes and their symbols, together with numerous occult relationships between them and various natural objects. They usually begin with the "Tonalamatl," or the twenty days of a calendar unit (a month), with the god that rules over each, together with his symbols; this section is followed by numerous others of similar import, such as "The nine lords of the night hours." "The five and twenty divine pairs." "The four times five guardians of the Venus Period," "The five goddesses of the West and the five gods of the South," and so on. These data are usually in pictures alone, without inscriptions, and have been interpreted in great part through knowledge of the older Mayan and Mexican mythology, as recorded by the Spaniards, and still recalled in fragments by the living descendants of the old native civilizations themselves.

A certain degree of correspondence between the codices and the carved inscriptions upon the rock ruins is an item of vast importance and gives us the hope that by the use of both sources much of the mystery which has always surrounded these ancient civilizations may be ultimately explained.

74. *Possible Connection Between the Civilization of the Eastern and Western Worlds.*—It is only natural, in studying the remains of the civilization developed in Central America, with its highly developed hierarchy and its extensive ritual, that one finds constant

similarities or coincidences between them and the cults of the Old World—Egypt, Assyria, Babylon, or early Greece—and it is also natural that numerous theories should arise of pre-columbian connection between the two hemispheres. Especially has this field proved attractive to mystics of all nations, those whose natural impulses prefer the mysterious to the matter of fact. Such students find without difficulty in these unknown and imperfect relics of an involved priesthood a direct connection with mystic rites in other places and times.

While, however, one cannot be too dogmatic, it is at present a safe point to remember that the more sober scholars find in the American civilizations nothing which cannot as well be explained through a development in place, without the aid of extraneous influence. Thus in what is yet known of the archeology of the New World, neither bones nor ruins, neither culture deposits nor artifacts, give any definite suggestion of anything further than the activities of an homogeneous race of people, comparatively late comers, who found their way to the Western World a few thousand years ago, when the surface of the land was about as at present, and who, in the course of their generally nomadic existence, covered the greater part of both continents with a sparse population. In certain spots favored by the climate, they became more sedentary and developed a rather high grade of civilization, advancing in culture to a grade corresponding to the early Cyprolithic or even the early Bronze Age of Europe.

The region of the Old World from which they came, and the route or routes by which they attained the American continent are still problems not definitely

solved, but in the general opinion of scholars the place of origin was somewhere in northeastern Asia, and the route of approach was either by the Alcutian Islands, across Behring Strait, or by a more southern route, involving a longer or shorter journey by sea. The fact that the inhabitants of both Americas were ignorant of sails at the time of the discovery by Europeans shows that any journeys by water must have been made in primitive dugouts, propelled by paddles or oars. Confessedly the manner by which the ancestors of the American Indians arrived in the New World is still obscure, but the idea that they, like the late arrivals from Europe, are not autochthonous but emigrants from the Eastern Hemisphere, is opposed to no definite and positive facts and is quite in accord with the known data.

CHAPTER VI

KNOWN TYPES OF PREHISTORIC MAN

Early Speculations and Discoveries.—The Neandertal Man (1856)—More Individuals of the Neandertal Race; the Two Skeletons from the Spy Grotto (1885-1886)—The Cannibal Feasts at Krapina (1899-1905)—The Young Boy in the Cavern of Le Moustier (1907)—The Skeleton of La Chappelle-aux-Saints (1908); The Most Recently Discovered Remains of *Homo neandertalensis*—Some Ancient Skulls from Old Collections, with Supposed Affinities to *Homo neandertalensis*—The Three Quarternary Races of *Homo sapiens*: Cro-Magnon, Grimaldi, and Aurignac—Paleolithic Human Remains of Doubtful Position, but Representing the Modern Species, *Homo sapiens*—Late Paleolithic Interments; the First Brachycephals—Early European Ape-Men: *Homo heidelbergensis* and *Eoanthropus dawsoni*—The Javan Ape-Man: *Pithecanthropus erectus*—Hesperopithecus haroldcooki—Speculations Concerning the Pedigree of Modern Man.

75. *Early Speculations and Discoveries.*—To races who are themselves well past the Stone Age the chance discovery of definitely shaped instruments of flint and other stones awakens a feeling of the mysterious, and these objects become naturally associated with such well-nigh universal myths as those of strife in heaven and of wars among the gods, especially as the majority of the instruments found are of a decidedly warlike character. Thus in the eleventh century a "heaven axe" was considered a suitable gift to pass between great emperors, and "even as late as the seventeenth century a French ambassador brought a stone hatchet, which

still exists in the museum at Nancy, as a present to the Prince-Bishop of Verdun, and claimed for it health-giving virtues.”¹ The early years of the eighteenth century, however, began to dispel the mystery surrounding such objects, for travelers like Jussieu and Lafitau described precisely similar implements which they had seen in use among primitive peoples still alive; “also there was found in the year 1715 in the heart of London (Gray’s Inn Lane) a large pointed weapon of black flint . . . in contact with the bones of an elephant, in a gravel bed.”

Yet instances like this last, so wholly at variance with the teachings and ideas of the times, were for the most part disregarded, and, although such cases were few and far between, they were bound to multiply. Thus, in the year 1800, John Frere found at considerable depth in the clay beds of Hoxne, in Norfolkshire, crude flint implements, which could not have been introduced there but must have been built into the deposit during its formation. Still better testimony to the existence of prehistoric man in Britain came from the investigation of a cavern near Torquay, in Devonshire, commonly known as “Kent’s Hole,” the initial exploration of which began in 1825 by the work of Rev. Mr. McEnery, a Roman Catholic priest. He found here “in red loam covered with stalagamite, not only bones of the mammoth, tichorrhine rhinoceros, cavebear, and other mammalia, but several remarkable flint tools, some of which

¹ Andrew Dixon White, in the “History of the Warfare of Science with Theology,” Appleton’s, New York, 1896, Vol. 1, pp. 266-267. From this source also is taken the list of early discoveries of the remains of prehistoric man which immediately follows.

he supposed to be of great antiquity."¹ It is always to be regretted that the discoverer kept his notes in manuscript and never published the detailed results of his investigation.

Almost simultaneously with the first investigation of Kent's Hole by McEncry (1823) ancient human bones were found by Boué deep in the alluvial deposits of the Rhine, under circumstances that showed them to have been contemporaneous with the formation of the deposit, but this discovery was not especially to the taste of Cuvier, to whom the bones were brought, and the find was virtually suppressed.

But such suppression can be but temporary and local, and, once men's attention was called to the possibility of such discovery, no matter what their teachings or tendencies, new reports of similar finds came thick and fast, and in many parts of Europe. "In 1828 Tournal, of Narbonne, discovered in the neighbouring cavern of Bize specimens of human industry, with a fragment of a human skeleton, among bones of extinct animals."² In 1829 came the investigation of the caves of Gard, near the former one, by Christol; in 1833 that of the caverns of Engis, Engihoul, and many others in Belgium by Schmerling; and in 1840 a renewed and careful study of Kent's Hole by Godwin Austin. In these researches human bones were frequently found; for instance, there was obtained at Engis the cranial portion of a skull, and at La Naulette a jaw, which excited special interest. Later investigation has resulted in a lessened interest in the skull from Engis, but the

¹ Sir Charles Lyell, "Antiquity of Man," London, 1873, p. 98.

² Andrew D. White, *loc. cit.*, p. 270.

La Naulette jaw is chinless, and may be brought into line with a number of later discoveries to be considered elsewhere. All these discoveries, so far as concerned actual skeletons, were soon eclipsed by the discovery in 1856 on German soil, but near the Belgian frontier, of the famous Neandertal skeleton, in the valley of that name, near Düsseldorf.

76. *The Neandertal Man* (1856).—“The spot is a deep and narrow ravine about seventy English miles northeast of the region of the Liége caverns (Engis, etc.) . . . and close to the village and railway station of Hochdal between Düsseldorf and Elberfeld. The cave occurs in the precipitous southern or left side of the winding ravine, about sixty feet above the stream, and a hundred feet below the top of the cliff.”¹

The cave was a narrow fissure or cleft, with an opening, as stated by Lyell, sixty feet up the steep face of the cliff. Here, when first examined by Dr. Fuhlrott² of the neighboring city of Elberfeld, the cave expanded from the mouth into a small room, seven feet wide and fifteen deep, and high enough to allow him to stand upright. The deposit upon the bottom was composed of a loam or mud, “mixed with rounded fragments of chert,

¹ Sir Charles Lyell, *loc. cit.*, p. 80. Lyell visited the spot in 1860, in company with the discoverer, Dr. Fuhlrott, who brought with him the original skull. In the four years since the discovery the work of quarrying the stone from the face of the cliff had made profound changes, and the site has since then been entirely obliterated. We have thus only the verbatim descriptions of the few savants acquainted with the place. The cave in question bore the name of the “Feldhofner Grotte.” Lyell’s figure of it is given elsewhere in this work (Fig. 9, p. 50).

² Fuhlrott, “Der Fossile Mensch aus dem Neandertal.” Duisberg, 1865.

and was very similar in composition to that covering the general surface of that region."¹ In this deposit was found the skeleton of a man, which presented a number of surprising characters; but, although it was probably complete and in a good state of preservation when uncovered, the discovery was made by the workmen engaged in quarrying out the stone, and they had taken the skeleton out before any scientific man arrived. When Dr. Fuhrrott arrived on the spot he learned that only the skull and some of the larger bones had been saved, and he succeeded in securing only the following: the cranial portion of the skull, without trace of face; both femora; the right clavicle, scapula, humerus, ulna, and radius; the left humerus and ulna; the left os coxae, and five rib fragments. The most of these were in fairly complete condition, but the right scapula, left humerus, and the hip bone were deficient.

It was also unfortunate that the relations of the cavern and the deposit were such as not to allow an exact, or even approximate, estimate of age. The deposit, which showed no trace of stalagmite, may possibly have been washed down into the cavern through the fissure which, extending obliquely downward for a distance of a hundred feet or more, connects the cavern with the surface of the upper level, and if so, the skeleton enclosed within it probably came by the same route. On the other hand, it is more likely that the deposit was washed into the floor of the cave by the spring overflows of the river Düssel at the time when it flowed at the level of the mouth, and before its action

¹ C. Lyell, *loc. cit.*, p. 62.

had cut out the final sixty feet of the ravine. In this latter case either the body may have been brought in with the water or else the man, taking shelter within the cave may have died there, and been covered up by subsequent deposits. In the former case both the deposit and the skeleton brought in with it may have been of any age, either recent or old; in the latter, the date of both must have been very remote. Whether, with modern experience, a definite date could have been assigned to the skeleton of the Neandertal cavern, were it excavated to-day, cannot now be stated; at least at the time no certainty was felt concerning the geological proof of age, but the attention was riveted rather upon the extraordinary form and proportions of the skeleton itself.

The separate bones were of a caliber and thickness unknown in men of the modern type, and the cranium was extremely large and heavy. At the same time, the limb bones were about the same length as those of a modern man of rather short stature, and refuted at once all notion of extraordinary height. The muscular attachments were exceptionally large and conspicuous, and "some of the ribs, also, were of a singularly rounded shape and abrupt curvature, which was assumed to indicate great power in the thoracic muscles."¹ But the most singular formation was exhibited by the skull. Although massive, and of dimensions exceeding that of the average of any living race, the entire cranial roof was depressed below that of the lowest savage, and the orbits were overhung by heavy projecting ridges. Professor Huxley said, "There can be no doubt that . . .

¹ Lyell, *loc. cit.*, p. 83.

this skull is the most brutal of all known human skulls, resembling those of the apes not only in the prodigious development of the superciliary prominences and the forward extension of the orbits, but still more in the depressed form of the brain-case, in the straightness of the squamosal suture, and in the complete retreat of the occiput forward and upward, from the superior occipital ridges.”¹

Naturally, opinions were much divided concerning so remarkable a skeleton. Those who considered it a man had to agree with Professor Huxley that it was “the most pithecid of human crania yet discovered.” Others considered it not a man at all but an ape, or perhaps an individual which happened to show an extraordinary amount of reversion. The most prominent of these latter was Rudolf Virchow, the great pathologist, who unfortunately expressed as his official opinion that the bones were not normal and were probably those of a congenital idiot!² At a later time he doubted the geological age of the bones and suggested that they probably belonged to the Merovingian period, or might even have been those of a Cossack who perished in the Napoleonic wars!³

On the other hand Professor Schaffhausen, who published the first memoir on the subject,⁴ considered the

¹ Quoted by Lyell, *loc. cit.*, p. 89.

² R. Virchow, “Untersuchung des Neanderthalschadels,” Berliner Gesellsch. für Anthropol. Ethnol. und Urgeschichte, 1872; also, Archiv für Anthropol., Bd. VI, 1873.

³ Cf. the review by Klaatsch in *Anat. Ergebnisse*, Bd. IX, 1899, p. 425.

⁴ Schaffhausen, “Zur Kenntniß der ältesten Rassenschädel,” Müller’s Arch., 1858. A translation of this review by Busk, with some notes of his own, appeared in England in the *Nat. Hist. Review*, No. 2, April, 1861.

skeleton that of a normal individual, though of a race hitherto unknown. The depression of the forehead was a natural character, not the result of any artificial deformation such as is frequently practised by primitive peoples.

77. *More Individuals of the Neandertal Race; the Two Skeletons from the Spy Grotto (1886).*—For thirty years after its discovery the Neandertal skeleton was destined to remain unique, and in spite of the opinions of Huxley, Schaffhausen and others, to the effect that it was a normal specimen of a race, or even a species, more ape-like than any yet known; in spite also of the manifest desire at that very time to furnish a spectacular proof of human evolution by presenting something like the “Missing Link” of popular demand, still the unqualified statement of so great an authority as Virchow, and the acceptance of it by a few such men as Johannes Ranke, naturally dissuaded anatomists from carrying on further researches in the matter, and the bones lay accumulating dust upon a shelf in the Museum of the University of Bonn. This attitude was, however, changed at once by the fortunate discovery in the years 1885 and 1886 of the skeletons of two more individuals with characters practically identical with that from the Neandertal, and presenting a few more parts, not found in the Neandertal specimen, notably the mandible, and a portion of the maxilla.¹

¹ *First announcement:* de Puydt and Lohest, in *Ann. Soc. Biol. Belgique*, 1886.

Definite paper: Fraipont and Lohest, “La race humaine de Néanderthal ou de Canstadt en Belgique. Recherches ethnographiques sur des ossements humains, découverts dans dépôts quaternaires d'une grotte à Spy et détermination de leur âge géologique.” *Arch. de Biol.*, 1887, T. VII, pp. 587-757 (with four plates).

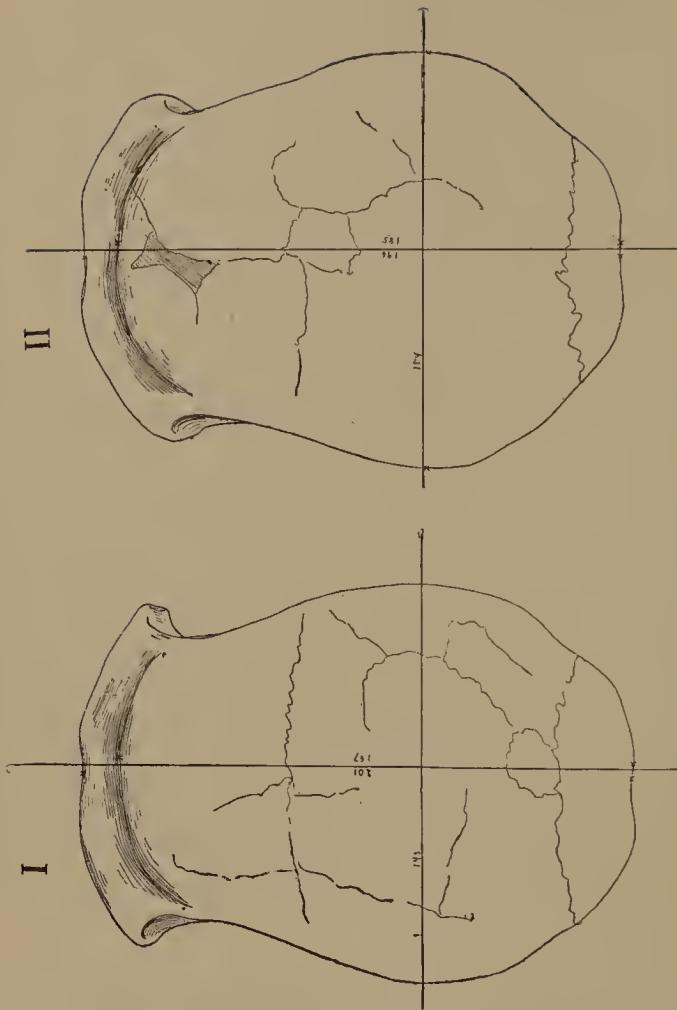


FIG. 97.—The two crania from the Spy grotto, in Belgium. Drawn from casts. Spy II is rather small for skulls of this race, and is probably female. It is also broader than Spy I. The length and breadth measurements of the two are respectively 145/201 and 136/154, which give the length-breadth indices as 72.1 and 78.06.

This discovery was made in the grotto of Spy, near Namur, in Belgium, by MM. Marcel de Puydt and Max Lohest, but the two associated with themselves M. Fraipont, the colleague of Lohest at the University of Liège. The bones were preserved in this latter institution. Here, contrary to the ease of the Neandertal skeleton, the excavation was made by scientific specialists, and every detail of the site, such as position, associations, and so on, was accurately observed. In the place where the skeletons lay, rather across the mouth of the cave than within it, a cross section of the deposit presented three layers: an upper one, containing worked flints of the Mousterian and Solutrean types, a middle layer, containing flints of the Montaiglian (or Aurignacian) type, and a bottom layer, without doubt Mousterian. In all three layers bones of the mammoth were found, and in the two lower ones those of the *Rhinoceros tichorhinus* occurred also. The skeletons lay directly upon the lowest layer, firmly imbedded in a breccia which ran all through the middle layer, and resisted the stroke of the pick. There was felt absolutely no doubt on the part of the discoverers that the skeletons were contemporaneous with the deposits, that is, with the culture and fauna represented there, but there was room for discussion as to whether the men had simply died on the spot, resting on the lower layer, or whether there had been an intentional interment while the second layer was being deposited, although the discoverers inclined to the first view. The two skeletons lay about 2.5 meters from each other, one of them across the axis of the grotto, resting upon the side, and with the hand placed

against the lower jaw. The position of the other was not determined.

Here, then, was an absolute proof of the existence in Europe, contemporaneously with the mammoth and woolly rhinoceros, of a low type of man, more bestial in appearance than any race now living; the men associated with the Mousterian culture. The bones were, moreover, identical with those from the Neandertal cavern, thus forever disproving the contention of Rudolf Virchow, supported by Johannes Ranke, that the latter bones were pathological, and probably belonged to an idiot. The Spy skeletons were somewhat more complete than was the Neandertal, and supplied among other parts, a nearly complete mandible and maxilla, with teeth. The mandible was chinless like that of La Naulette, that is, although unusually broad and heavy in the symphysial region, the profile outline of the jaw drops downward or even a little backward from the base of the alveolar region, as in the simian apes, without a trace of the mental prominence, or chin, which characterizes even the lowest of modern men. The other ape-like characters, such as the heavy and projecting supraorbital ridges, the retreating forehead, the lowness of the cranial dome, and lastly a marked tibial retroversion, preventing the legs from becoming perfectly straight, are alike in all three skeletons in question, and together make up a picture of a being sufficiently unlike any modern race to form a new species, *Homo neandertalensis*, named from the locality of the type specimen.

78. *The Cannibal Feasts at Krapina (1899-1905).*—Since the two sites which had hitherto yielded remains of this primitive type of man were located near together

in northwestern Europe, the next discovery of similar remains from near the southeastern corner of the continent came as a surprise. This time it was in the little town of Krapina in Croatia, almost on the southern boundary of Hungary, where a deposit of diluvial (quaternary) age had been opened up, and where, in 1899, Professor Gorjanovic-Kramberger, from the neighboring University of Agram, found the first of the series of human bones destined to make the site famous.¹

The site, in its original condition, was a shallow niche excavated by natural forces in a nearly white Miocene conglomerate. This niche, perhaps fifty feet wide and half as deep, possessed a fairly level floor, at the outer limit of which, a few feet deeper, flowed a small brook or creek. Occasional inundations of the brook at high water covered the floor with deposits of sand and mud, and a layer or two of pebbles, and within this were buried the shells of fresh-water mollusks and the bones of the beaver. This floor, beside the brook, formed an ideal camp-site for man, and here he left, not only his crude flint implements, but his hearths, constructed of stones, his piles of ashes, and the bones of the animals brought there for food, and split for marrow, as with primitive peoples everywhere. But here, among the victims, were plentifully scattered the bones of men, broken for marrow and occasionally calcined by the heat, too evident

¹ Gorjanovic-Kramberger, Karl, "Der diluviale Mensch von Krapina in Kroatiens; ein Beitrag zur Palaeanthropologie," Publ. in a series by Walkoff; *Studien über die Entwicklungsmechanik des Primatenskeletes*, 4°, pp. 59-277 (14 plates and 52 text figures).

An excellent résumé of the excavations at Krapina is given by Obermaier in *L'Anthropologie*, 1905, p. 13, "Les stations paleolithiques de Krapina."

witness of cannibalism. In the intervals of human occupancy the conglomerate from the walls of the niche, as indeed continues at the present time, loosened and rattled down upon the floor, covering up bones, hearth, implements, and all signs of human activity, so that each new camping party would live on the top of the previous deposit without disturbing it. In this way there succeeded one another no less than nine culture layers, each contributing toward the filling up of the niche, until, no longer of value as a shelter, it finally disappeared entirely and the site presented the appearance of a smooth, steep hillside. Meanwhile the brook, the Krapinica, cut deeper and deeper into its bed, as the floor of the niche rose, so that during the human occupancy it was no longer possible for the brook to inundate the cave, while it became constantly more of a climb for the men wandering along the brook to ascend to the floor of the niche. At present the niche lies high up on the side of a ravine, while the Krapinica flows, a small stream two or three feet wide, seventy-five feet below.

The scientific excavation of this site, slow and difficult because of the hard nature of the deposit, continued nearly every summer from 1899 to 1905, and ended only with the complete clearing out of the former niche, leaving nothing further to be done here. Each of the nine layers contained fragmentary human bones, and scattered generally through them all were artifacts of the Mousterian and Aurignacian types, as well as the bones of *Rhineroceros merckii*, *Ursus spelaeus*, *Bos primigenius*, and other characteristic Quaternary animals.

What type of man the cannibals themselves may have

been cannot be surely known, but the abundant fragments of their victims show in every feature the characteristics of the skeletons of Spy and Neandertal, and it may be supposed, with some degree of probability, that the eaters were of the same race. Certain it is that



Fig. 98.—Site of the excavation at Krapina in Croatia, from a photograph by H. H. and I. W. Wilder. This figure is made by piecing two separate photographs together, and although they do not exactly match, they give a good idea of the place. Originally the site was a level shelf in the side of the valley, at the level of the brook, the Krapintza; gradually the brook has cut deeper and deeper, while the shelf has become covered up by debris that has rattled down from above. The removal of the debris uncovered no less than nine fire-sites, each with the remains of human bones.

the culture associated with the hearths was no higher than that of the Mousterian, or at best, Aurignacian, since to these periods belong the artifacts, undoubtedly for the most part the property of the cannibals rather than the victims, and in at least one discovery since then

similar tools have been found in close association with *Homo neandertalensis*. Among the fragments occurred frontal pieces with typical supra-orbital tori, the heavy ridges so long commented on in the case of the skeleton of Neandertal; the mandibles were chinless, the foreheads retreating, and the cranial dome low. It is, however, of note that the cranial outlines showed the proportions of brachycephalic heads, rather than the marked dolichocephaly of the western specimens, and thus suggest a differentiation into races, somewhat paralleling that of the modern species.¹

Even among the Krapina remains themselves there were at least two well-marked varieties, a heavy and robust type, and a light and graceful one, named respectively by Gorjanovic-Kramberger *H. primigenius*,² var: *spyensis* and *H. primigenius*, var: *krapinensis*. Although well seen in many of the other bones the characteristics of the two varieties are especially contrasted in the mandibles, which in the first case present a wide, heavy

¹ Thus in the case of the skull designated as "C," Gorjanovic-Kramberger, by methods of construction, determines the length-breadth measurements as 178 and 149 mm. which gives an index of 83.7. This may be compared with the indices of the western specimens; Neandertal 147/199.5 = 73.6; Spy I 145/201 = 72.13; and Spy II 154/196 = 78.6; *loc. cit.*, p. 96. "Krapina D," a larger individual than "C" gives the figures 169/197.5 = 85.8.

² The German anthropologists, headed by Schwalbe, who first definitely proved the Neandertal type of man to belong to a distinct species, adopted for it the name of *Homo primigenius*, originally proposed by Wilser in 1897. The type had long been called, however, the "Neandertal man," and King in 1864, and Cope in 1893, had proposed for it the scientific name of *Homo neandertalensis*. Aside from priority the name "primigenius" lost its meaning with the discovery of the Heidelberg jaw, and thus from all reasons the name *neandertalensis* is to be preferred.

body like that of the Spy skeleton No. 1, while in the other the body of the jaw is as narrow as in *Homo sapiens*, but as chinless as the first. Thus, as measured from the casts, the widths of the jaw of Spy I, from the alveolar edge to the mental ridge, in the median line (symphysial height)¹ is 34.5 mm.; in a heavy Krapina jaw, 37.0, and in a light Krapina specimen but 29, about an average for *H. sapiens*. Upon the side, beneath the middle of the second molar tooth, the respective measurements are 31.5, 33.5, and 27. The three jaws here compared are all of them adults, not senile, and in general outline are of about the same size.

79. *The Young Boy in the Cavern of Le Moustier* (1907).—Hard upon the completion of the excavation of the niche at Krapina came the unearthing of a skeleton of *Homo neandertalensis* at the classic French station of Le Moustier, in the valley of Vezère.² The prehistoric station here consists of four separate rock shelters, “*abris sous roches*,” opening from as many terraces of a steep mountain slope, almost in a perpendicular line, one above another. Of these the three upper ones had long been the site of archeological labors of much

¹ As measured by Fraipont this jaw was 38 mm. wide; but Schoetensack, who remeasured it in connection with his work on the Heidelberg jaw, could not possibly make it over 35 mm.

² H. Klaatsch und O. Hauser, “*Homo mousteriensis hauseri*. Ein altdiluvialer Skeletfund im Departement Dordogne und seine Zugehörigkeit zum Neandertaltypus.” Arch. für Anthropol., N. F., Bd. VII, 1908. The discovery is reported also by Klaatsch in the Anat. Ergebnisse (Merkel und Bonnet), Bd. XVII, 1907, pp. 448-457.

H. Klaatsch, “Die Fortschritte der Lehre von der Neandertalrasse.” In Merkel u. Bonnet’s Ergebn. der Anat. u. Entwickel., Bd. 17, 1907, pp. 431-462. Six plates. (This includes a review and criticism of the paper of Sollas.)

importance, and have furnished both name and type of artifaet to the Mousterian Period of the Paleolithic Age. The lowest shelter, however, had long been concealed under the foundation of a barn, the removal of which at about this time gave Dr. Otto Hauser, a Swiss archeologist, the opportunity to excavate. But ten meters distant from the site rendered classic by the labors of Lartet and Christy in 1863, the shelter yielded an abundance of artifacts, including *coups de poing* of the Acheulian type and typical Mousterian implements. Here in March, 1907, Hauser first came upon the skeleton in question, but took the precaution to cover it up again, and postponed further work until the 10th of the next month, when he continued the excavation in the presence of witnesses, who made affidavit that the deposit about and above the skeleton was undisturbed. After this he again paused, and the final removal of the bones was made the following August, in the presence and with the help of a number of noted anthropologists, assembled for the purpose.

The skeleton proved to be that of a young person, probably male, with a massive head and heavy jaws, and short limbs. The leg bones were exceptionally short (femur 380, tibia 90 mm., max. length), but as shown by the separate ephyses, indicated mainly that the adult length had not been reached. The stature, as based upon the leg bones, was estimated at approximately 1450-1500 mm. The teeth of both jaws were well preserved and were notably large and heavy, without trace of caries; the four third molars were still under the gums. The skull, which had to be carefully reconstructed from literally hundreds of fragments, exhibits the massive

proportions characteristic of the species *neandertalensis* and is a trifle larger than either one of the Spy skulls or the Neandertal, but a slight change of position in the fragments might vary the dimensions by several millimeters. The cast of the reconstruction by Klaatsch is 206 mm. in maximum length and 156 or more in breadth, but these figures may not be wholly reliable. As one would expect in an adolescent skull such features as the supra-orbital tori, so characteristic of the species, are not strongly expressed, but are well indicated, and need only the development of further growth.

In position the skeleton lay as if sleeping; the right side of the skull and the right elbow lay upon a flat block of flint, the elbow beneath the cheek, as if the head were resting upon the flexed arm, while the left arm was thrown out straight forward. At or near the place for the left hand was found a perfect Mousterian axe, of ovate outline, and flat, with the edge running entirely around. Although, in a deposit abounding in artifacts, difficult to prove, the impression was given to the excavators that the axe and skeleton had been originally associated, and that the body of the young boy had been carefully placed by his friends in the position found, with his axe in his hand. There thus comes at once the impression of a cult, a belief in a life after death, and at the least the affection of parents or friends; a pleasing contrast to the many and repeated cannibal feasts at Krapina. The study of Quaternary man has hardly begun, however, and the discoveries of the next few years may be expected to furnish more information, not only concerning the bodily characteristics, but also con-

cerning the mode of life and stage of culture of those remote times.

80. *The Skeleton of La Chapelle-aux-Saints (1908).*—Two years after the excavation of the skeleton at Le

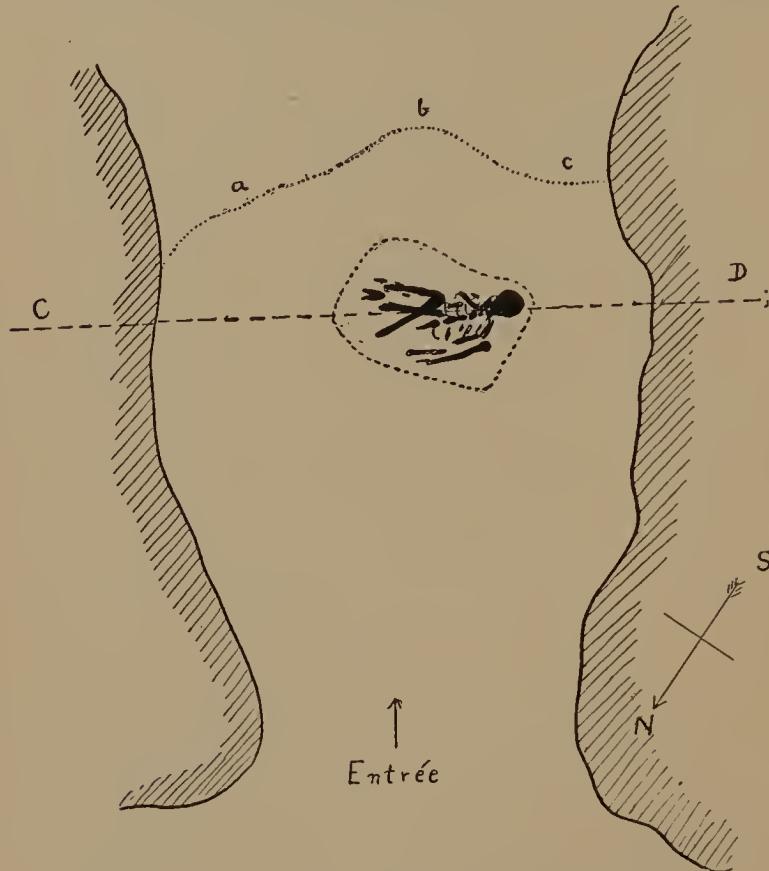


Fig. 99a.—Ground plan of the cave at La Chapelle-aux-Saints.

Moustier, and before the final results of this find had become generally disseminated, came the news of the discovery, in a neighboring Département, that of Corrèze, of still another skeleton of *Homo neandertalensis*, much

more complete than any previously known. The discovery was made in a little grotto near the village of La Chapelle-aux-Saints by two young priests, their younger brother, and a friend.¹ These young men, the MM. Bouysomie and M. Bardon, had excavated and explored this grotto for some time previous, and had collected from the culture deposit found within a number of



Fig. 99b.—Cross section of the cave at La Chapelle-aux-Saints, taken through the line CD in Fig. 99a.

paleoliths of the Mousterian type, together with the bones of the animals used for food. In thus excavating they revealed in section a depression in the bed rock at the bottom of the deposit, suggesting a grave, and while continuing the work further within this, without especial care, the young brother, Paul, found, and drew out, a humerus that was unmistakably human, and almost immediately uncovered a cranium with neandertaloid

¹ Boussonie, A. et J., et Bardon, L., "Decouverte d'un Squellette humain Mousterien à la bouffia de la Chapelle-aux-Saints (Corrèze)." *L'Anthropologie*, T. 19, 1908, pp. 513-518.

M. Boule, "L'Homme fossile de la Chapelle-aux-Saints." *Ibid.*, pp. 519-525.

characters. Save for a displacement and slight distortion of the parts as the result of the pressure of the deposit accumulated above it, the skull was practically entire, and was taken up, together with the soil about it, in one piece. The other bones of the skeleton were then removed with apparently as much care as could well be expected of four young men not trained for such work, especially as they found themselves "*dans la nécessité de nous hater, pressés par le temps et les circonstances*" (*loc. cit.* p. 514). Probably the expert excavators from Le Moustier would have been able to remove this skeleton in a better state of preservation, and, through the employment of technical methods, and by taking several days for the work, might even have gotten it out practically entire, in spite of the fact that the young men found that the bones broke "*trop souvent au moindre effort*"; yet the work was done most conscientiously, and represents the best efforts of the excavators, so that even with the imperfections which a greater technical skill might have obviated, the skeleton of La Chapelle-aux-Saints is by far the best and most complete specimen of *Homo neandertalensis* thus far known.

The skull, slightly restored in places by M. Boule, to whom the young men sent their find, reveals for the first time the exact lines and proportions found in the actual head and face of this species. Although the head is a little larger than any of the previous ones (max. length 208 mm; max. breadth 156), the stature, as well as can be made out from the incomplete leg-bones, was rather short, not above 1600 mm, a few points above the average given for 1200 Japanese soldiers (1585 mm). The femur

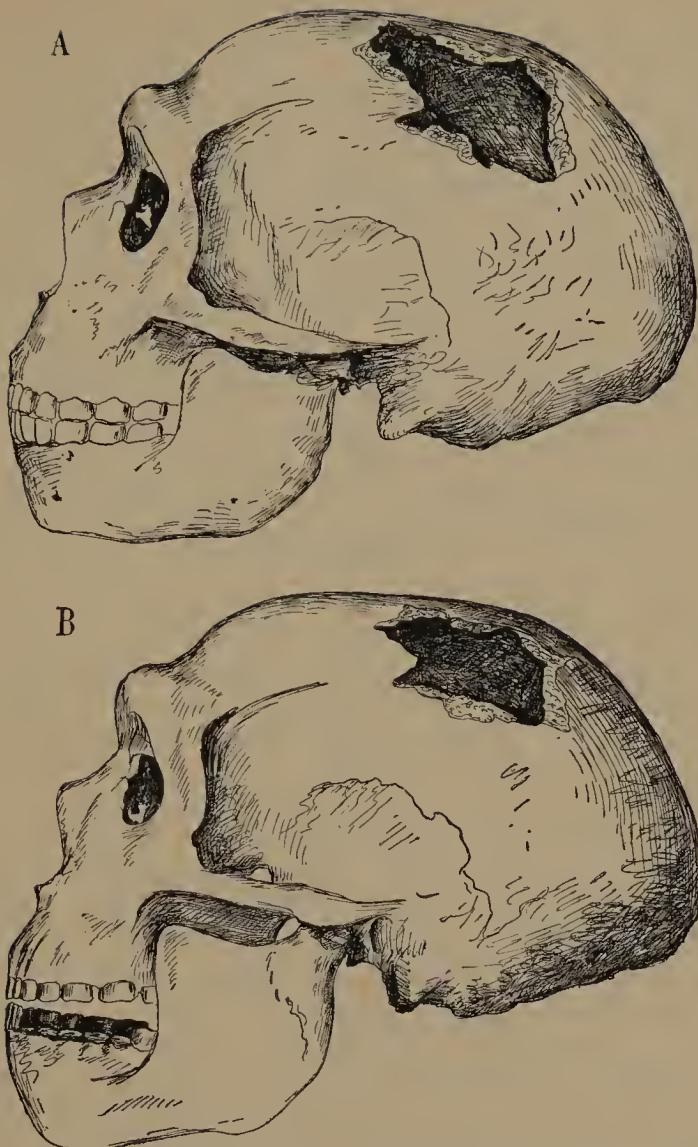


Fig. 100.—Two views of the skull of La Chapelle-aux-Saints: A. Fitted with the rightful jaw, but with the teeth and alveoli rejuvenated, as the actual skull was senile. B. Fitted with the jaw from the Sands of Mauer, *Homo heidelbergensis*, to show that this latter type may not have been so very unlike the Neanderthal type. (After Boule, in *L'Anthropologie*.)

shows a marked curvature, and the axis of the tibia displays a sharp bend near the proximal end (retroversion), both characters quite as in the other *neandertalensis* specimens and hence normal specific characters. Because of these the legs "*avaient normalement une attitude fléchie se rapprochant de celles des Anthropoides, dont la plupart ont aussi des femurs très courbes et des tibias très retroversés.*"¹ The fibula was of greater caliber than in modern man, as indicated by the articular surface for it upon the distal end of the tibia, and this, together with numerous indications in the joints of the tarsus, suggests an habitual inturning of the soles and the necessity of resting upon the outer edge of the foot when walking, again a decided simian character.

These suggestions of a body well adapted for a life in part arboreal are further corroborated by the stoutness of the humeri with their large heads, characters which reveal great strength in the shoulder joints; by the strong outward curve of the radius which broadens the interosseous space and membrane and increases the surface of origin for the flexor muscles of the fingers; and again by the few extant finger bones themselves, which are short and extremely large in caliber. The thumb was more readily opposable than in modern man, and possessed a freer motion. Finally the enormous head, resting upon an extremely short neck, was carried far forward, as in the large man-apes, a character indicated by the shape and position of the occipital foramen,

¹ M. Boule, "L'Homme fossile de la Chapelle-aux-Saints" (Second article). *L'Anthropologie*, T. 20, 1909, pp. 257-271. The quotation is found on p. 270.

elongated anteroposteriorly and placed farther back than in the modern species.

Yet, in spite of the undeniably simian characters shown in the bodily frame of the species *neandertalensis*, there was here as in Le Moustier, abundant evidence of an intentional interment, with some care in the disposal of the body. The excavation in the soil underlying the deposit of a suitable shape and size for the reception of a body, must have been a grave dug for the purpose, and the leg-bones of a wild ox, found in close association with the head, were in all likelihood placed there intentionally to supply the wants of the deceased. A more positive evidence of the developing mentality of the species was shown later in a most convincing way by MM. Boule and Anthony, who succeeded in making an intercranial cast of the brain, in which they were enabled to locate and study a number of important superficial features. These features, such as the fissures and convolutions, showed in general a character intermediate between that of the highest apes and modern man, as shown by accurate measurements, and the only fair conclusion is that the mental characters were also intermediate. "*Il est donc probable que l'Homme de la Corrèze et l'Homme de Neanderthal ne devaient posséder qu'un psychisme rudimentaire, supérieur certainement à celui des Anthropoïdes actuels, mais inférieur à celui de n'importe quelle race humaine actuelle.*"¹ The reduction of the foot of the third frontal convolution indicates, if not the actual absence

¹ M. Boule et R. Anthony, "L'Encephale de l'Homme fossile de la Chapelle-aux-Saints." *L'Anthropologie*, T. 22, 1911, pp. 129-196 (26 figs.). The quotation occurs on p. 194.

of an articulate language, at least the existence of only a very rudimentary one; the slight preponderance of the left side over the right shows, not the fully developed right-handedness of modern man, but only the beginning of such a condition; and thus wherever a physiological or psychic character can be interpreted from a supereial anatomical one, the result of the examination shows a condition somewhere between that of the apes and that of modern man. The brain of *Homo neandertalensis* “est déjà un encéphale humain par l'abondance de sa matière cérébrale. Mais cette matière manque encore de l'organisation supérieure qui caractérise les Hommes actuel” (*loc. cit.* last sentence).

81. *The Most Recently Discovered Remains of Homo Neandertalensis (1909-1911).*—Since the discovery and successful excavation of the skeleton at La Chapelle-aux-Saints several others of the same species have been found, so that there is no longer any doubt concerning the presence of this type of man in western Europe, and no considerable gap left in the knowledge of his bodily form.

The year following the discovery of the Neandertal skeleton at La Chapelle-aux-Saints, on September 17, 1909, a similar skeleton was found by Capitan and Pyronie in the cavern of La Ferrassie in the Dordogne, near the famous center of Les Eyzies. This site, which is rich in artifacts of the Paleolithic Age, from the Acheulian to the Aurignacian, presents definite layers of all these periods in succession, and the skeleton was found in the lower Mousterian, resting upon the surface of the underlying Acheulian. As this was not an

intrusive burial of a later date, the skeleton is precisely dated, and comes definitely from the lower Moustierian.

It was that of a male, with all the characters of the Neandertal species. It was lying upon its back, with the legs drawn up toward the pelvis, with the face turned a little toward the left, and with the mouth widely open. The left arm was lying along the side and the right arm was bent, and a little elevated. There were no indications of intentional burial, other than the fact that it had not been disturbed by wild beasts, which points either to some sort of structure originally piled upon it, or to its being left in the interior of the cave during a continued human occupancy.

On September of the following year, 1910, the same investigators found a second skeleton of the same type and period. This was very near the first; and was that of a small female. In August, 1912, some remains of children were found at the same place.

Again, about a year from the discovery of the second La Ferrassie skeleton, on September 18, 1911, still another skeleton of *Homo neandertalensis* was found by Dr. Henri-Martin in the cave of La Quina (Charente), the Département adjoining that of Dordogne on the northwest, and near the type station of Aurignac. This also lay at the base of the lower Moustierian deposit, but the parts were somewhat dislocated, and the general impression was given that the body had been long macerated by water, and had finally been carried into the cave by an overflow of the adjoining river, which buried it at the same time in sand. This skeleton, probably female, showed separation of the cranial bones at the sutures,

evidently due to the maceration; yet as the teeth, which were very large and strong, were well worn on the biting surfaces, the individual must have been fully mature, probably from twenty-five to thirty years of age.

The cranium, as is usual in the western specimens of this ancient species, was very dolichocephalic, and showed an index of 65-68. The face was poorly preserved, but the proportions of one of the orbits could be partly made out. The left ramus of the jaw was present, and showed enormous proportions, as in the large apes. In front the jaw was chinless, and typical for the species. As in the case of the skull of La Chapelle-aux-Saints, an endocranial cast was made, and this showed a brain of similar proportions and of the same low type as the other. This La Quina skeleton has been placed, together with those from La Ferrassie, and La Chapelle-aux-Saints, in the Muséum d'Histoire Naturelle in Paris.

Since the discovery of this first La Quina skeleton, numerous other Neandertal skeletal remains have been found at the same site, until, in a recent article (*Journ. Phys. Anthropol. Jan.-March, 1922*) MacCurdy has been able to enumerate remains of some twenty individuals found here since 1911. Perhaps the most interesting find is that of a child of this same race, discovered by Mme. Henri-Martin while her husband was away at the war. This skull has been figured in *L'Anthropologie*, T. 31, p. 331.

The Broken Hill skull from southern Rhodesia, South Africa, is the latest of the remains of the Neandertal

race, and came to light in November, 1921.¹ This, although a near relative of *Homo neandertalensis* of western Europe, stood perfectly erect, as is seen by the position of the foramen magnum; also the face, between the nasal cavity and the mouth, is somewhat longer than in the *neandertalensis*. Perhaps the most sensational circumstance about this find is that, in its position geologically it does not appear to be very old, and is thought by some to have been deposited within recent times. Becoming extinct in Europe in the Middle Paleolithic, the Neandertal man may have continued existence in Africa much longer, gaining the modifications in which it differs from the typical *neandertalensis*, and continuing its existence up to quite modern times. Indeed, it has been seriously suggested, although improbable, that somewhere in the interior of the continent this ancient type is still alive, and may be found by some fortunate explorer in the flesh. This would only repeat the discovery of the Okapi, a mammal first known only from its fossil bones found in Europe, but afterwards discovered alive in Africa. Surely, "*ex Africa semper quicquid novum.*"

182. *Some Ancient Skulls from Old Collections, with Supposed Affinities to Homo Neandertalensis.*—In the collection of the Hofmuseum at Stuttgart there is a fragmentary human cranium which has had a long and curious history. Although the records are not absolutely reliable, it is supposed to have been one of the objects

¹The first announcement of this discovery appeared, accompanied by excellent illustrations, in the *Illustrated London News*, Nov. 19, 1921.

exhumed in the year 1700 in the neighboring town of Cannstatt, along with the bones and tusks of mammoths and similar remains of other Quaternary animals. Overlooked at the time, it was first described and figured by Jaeger in 1835, who noted its peculiar shape, especially the low forehead and the prominent superciliary ridges, and naturally, after the discovery of the Neandertal skull, the interest in this skull from Cannstatt became renewed. It was referred to by Fraas in 1866 and by Holder in 1867, and in 1870 was sent to Quatrefages, who, with his colleague Hamy, was then at work upon the "*Crania Ethnica*," which appeared in 1873. These authors also recognized a close similarity between the skulls of Cannstatt and Neandertal, and from them established a primitive human race, the oldest known, to which they gave the name of the "*Cannstatt race*." It seemed to possess the characteristics, now so well known, of the Neandertal skull: the exaggerated superciliary ridges, continued across the glabella and the low retreating forehead, and they noted also an extreme length for the frontal bone, measured over the outer surface from nasion to bregma. While others had already begun to speak of a "*Neandertal race*," these authors employed for the same thing the name of the prior discovery, as it should be considered the type.

Later students of the skull from Cannstatt, however, noticed that the characters of the Neandertal type, now still better known from the two specimens from Spy, were at the best but faintly shown by it, and in 1906 Sehwalbe, in an exhaustive memoir, at once historical and anatomical, removed it forever from the Neandertal type, and showed it to be not different from human skulls

of modern times.¹ Moreover, the data concerning the original find were confusing and uncertain, and showed that the cranium, and also several clay pots, were either the results of a late intrusive burial in the Quaternary deposit, or were from an ancient cemetery in the immediate neighborhood. Through the final conclusion, that the Cannstatt skull was in no way different from recent skulls, and that its date was in all probability no older than the late Roman period, or that of the still later invasions, this once celebrated specimen is removed from the field of the prehistoric. Naturally also the term "Cannstatt race," as the designation of that now known as "Neandertal" from the name of the type specimen, *Homo neanderthalensis*, is no longer to be used.

The "Sudbury calvaria," an English specimen, is still another case of ancient human remains excavated during the uncertain period, studied casually by the authorities of the time, and now revived and critically examined by the help of the more exact methods which the research of the last few years has developed. It was found about the year 1864 in an alluvial deposit near Sudbury in Derbyshire, associated with remains of *Bos primigenius* and *Bos longifrons*, and was figured and described by Edwin Brown in the Transactions of the Midland Scientific Association for the Session of 1864-1865. In 1866 Huxley described the skull, under the erroneous name of "Ledbury," and stated that "a little flattening and elongation, with a rather greater develop-

¹ G. Schwalbe, "Das Schädelfragment van Cannstatt." The third article of his "Studien zur Vorgeschichte des Menschen," published as a "Sonderheft to the *Zeitschrift für Morphologie und Anthropologie*, 1906, pp. 183-228 (one plate and 13 text figures).

ment of the supraciliary ridges, would convert this into the nearest likeness to the Neandertal skull which has yet been discovered.” Since the writing of this statement by Huxley the skull has remained unknown, and virtually lost, when, very recently, the English anthropologist Duckworth,¹ with the help of the son of the late Mr. Edwin Brown, has succeeded in finding it at Sudbury Hall, where “for forty-six years it has lain on a table in the gallery.” Thus found and identified, Dr. Duckworth has subjected the skull to a careful examination by modern methods, as a result of which it is shown that, while much of the resemblance to *Homo neandertalensis* is superficial, and vanishes upon detailed measurements, it is yet extremely primitive for *Homo sapiens*, and belongs in that category of intermediate forms, like the skulls of Galley Hill, Brux and Brünn, at present of uncertain position, and with an assemblage of low characters which are never found in combination in recent skulls.

Still another English specimen is the “Gibraltar skull,” in the Hunterian Museum of the Royal College of Surgeons in London, which has recently and definitely been recognized as a typical female specimen of the species *neandertalensis*. This skull has had a long and curious history, involving periods of interest and neglect, and the inevitable misunderstandings of the early work on prehistoric man.

According to Keith, who has worked out its early history (cf. *Nature*, Sept. 7, 1911), the first mention of it is

¹ W. L. II. Duckworth, “The Sudbury Calvaria”: a revised and extended description. *Journal of Anat. and Physiol.*, July, 1912, pp. 328-349 (17 figures).

in the minutes of a scientific society at Gibraltar, under the date of March 3, 1848: "Presented, a Human Skull from Forbes Quarry, North Front, by the Secretary." From Gibraltar the skull found its way to England, where it was studied by George Busk, and was the subject of a brilliant and humorous letter from the paleontologist Falconer to Busk (Aug., 1864), suggesting for the skull the name "*Homo: var. calpicus*, Calpe being the ancient name for the rock of Gibraltar." Falconer called the skull a "primate pithoecoid," and both he and Busk evidently regarded it as extremely primitive.

Concerning the deposit in which this specimen was found, or the surroundings and associated objects, unfortunately nothing is known, the only information concerning its antecedents being the note concerning it in the Museum catalogue, No. 371. "A mutilated cranium remarkable for the low, retreating forehead, prominent supra-orbital ridges, and peculiar conformation of the maxillæ.—From a quarry behind Forbes Battery in the breeched talus under the north front of the rock of Gibraltar."

Some few years after the correspondence with Falconer, Busk exhibited this skull before the Anthropological Congress held at Norwich in 1869, and Huxley, who saw it at this time, spoke of its primitive character. In the same year also the skull was described by Broca, who mentions especially the great size of the orbits. From this time on the Gibraltar skull excited no especial interest until, soon after the discovery of the Galley Hill cranium in 1888, the former was again brought to light for comparison, and placed by Macnamara with the

newly discovered one under the name of the "Galley Hill group."

Through subsequent study of these two specimens this enforced alliance has now been broken, and the skull from Galley Hill has been referred to the modern species, although showing certain primitive characters; while the one from Gibraltar has been definitely recognized as a typical female of *Homo neandertalensis*. This last decision was rendered positive by comparison with the skull from La Chapelle-aux-Saints, which showed an almost perfect face of this species. Allowing for sex differences, the skulls compare perfectly, and make an excellent pair for type specimens of this ancient species.

✓83. *The Three Quaternary Races of Homo Sapiens: Cro-Magnon, Grimaldi, and Aurignac.*—As has already been shown, the excavation of such skeletons as those of Neandertal, Spy, Krapina, Le Moustier, and La Chapelle-aux-Saints from undisturbed Quaternary deposits, in association with the remains of a typical diluvial fauna, such as the mammoth, cave-bear and rhinoceros, and with exclusive Paleolithic artifacts, shows abundant proof of the existence at that period of a low-browed human species, with large eyes and projecting jaws, with short, curved legs, and stout arms and chest: a form showing simian resemblances to a much more marked degree than are seen in any modern race. It is also certain, by means of the same definite proofs, the excavation of skeletons in undisturbed deposits, that men of the modern species, *Homo sapiens*, differentiated even into several distinct races, inhabited southern France at least at the same remote epoch, probably contemporaneously with the first.

The two chief sites from which such remains have been obtained thus far are (1) the cave, or *abri-sous-roche* of Cro-Magnon, at Les Eyzies, in the Département Dordogne, and (2) a series of grottoes upon the Riviera, almost at the boundary between France and Italy, where excavations have been largely carried on under the personal supervision of the ruler of that region, Albert, Prince of Monaco. The skeletons from these two localities represent two distinct races: the first, the "Cro-Magnon race," is named from the first locality, which has thus far produced only this type; the second, the "Grimaldi race," is negroid in character, and has been found in the site at Monaco, in association with the first, which is identical in character with that found at Cro-Magnon itself.¹

The name "Cro-Magnon" is given to a small rock shelter, a few minutes walk northwest of the village of Les Eyzies, in the heart of the cave district of the Vezère valley, Département Dordogne, southern France. It was first opened up in 1868, during the building of a railroad, and five skeletons were found by the workmen. Of these, parts of four were rescued by M. Lartet, and eventually

¹ For accounts of the skeletons from Cro-Magnon and vicinity, see: Lartet, "Une Sepulture des Troglodytes du Perigord," Bull. Soc. d'Anthrop., 1868, pp. 335-349. Quatrefages et Hamy, "Crania Ethnica," Paris, 1882.

For the site at Monaco, especially the Grimaldi race, see: Verneau, in *L'Anthropologie*, 1902, pp. 561-585; and 1906, pp. 291-320. The last paper gives a review of the excavations at this site, since the beginning, in 1872. Boule, in *L'Anthropologie*, 1906, pp. 257-290. The paper describes the geological conditions at the site.

The above work of Verneau and Boule, together with important papers by Villeneuve, Cartailhac, etc., is given in a collection edited by Albert, Prince of Monaco, entitled, "Les Grottes de Grimaldi," publ. 1906.

found to be representatives of a new human race. Although in date and associations belonging to the Aurignacian period and thus still Quaternary, they show none of the conspicuous characteristics of *Homo neandertalensis*, but fall quite within the limits of proportions of the species *sapiens*. The brows lack the heavy ridges; the orbits, instead of being large and round, with an orbital index of 96 or thereabout, are extremely narrow (microsème); and the jaw possesses a typical chin, with the point even a little emphasized, at least in a specimen of advanced age, the one described as the "Vicillard." Quite unlike *H. neandertalensis*, the race of Cro-Magnon was of very large stature, often considerably over six feet,¹ and the heads were extremely big, even exceeding those of large men of the present time. Thus, while it is

¹The total stature of typical individuals of the two races, Neandertal and Cro-Magnon, as given in Osborn, "Men of the Old Stone Age," p. 237 and p. 295, respectively, is as follows:

Neandertal race:

Neandertal (Boule)	1550 mm.	(5 ft. 1 in.)
Neandertal (Manouvrier)	1632	(5 ft. 4 in.)
La Chapelle (Boule)	1570	(5 ft. 1 in.)
La Chapelle (Manouvrier)	1611	(5 ft. 3 in.)
Spy (Manouvrier)	1633	(5 ft. 4 in.)
La Ferrassie I (Manouvrier)	1657	(5 ft. 5 in.)
La Ferrassie II	1482	(4 ft. 10 in.)

The last is probably a female; the others male. The average of the male Neandertal individuals is 1633 mm. (5 ft. 4 in.).

Cro-Magnon race:

Adult males of:

Cavillon	1790 mm.	(5 ft. 10 in.)
Barma Grande II	1820	(5 ft. 11 in.)
Baousso da Torre II	1850	(6 ft. 4 in.)
Barma Grande I	1930	(6 ft. 4 in.)
Grotte des Enfants	1940	(6 ft. 4 in.)
Average of males: 1870 mm. (6 ft. 1 in.)		
Woman from Cro-Magnon	1800 mm.	(5 ft. 10 in.)
Woman, Barma Grande	1650	(5 ft. 5 in.)
Youth of 15 yrs., Barma Grande	1650	(5 ft. 5 in.)

unusual in modern skulls to meet with one having a maximum length of 200 mm., or over, two casts from the original find, that of the "old man," and the one designated Cro-Magnon II, measure in length respectively 206 and 203.5. In this connection one cannot help being reminded of the enormous heads of *H. neandertalensis*, and the supposition has arisen from more than one quarter that the race of Cro-Magnon is a hybrid race, the result of the crossing of the two species. When, however, the separate features of these large skulls be considered, as given above, they are seen to be typical of the species *sapiens*, with no suggestion of the other species, and all support for the hypothesis vanishes.

As in all of the types of early man of either species, unless, possibly in certain of the Krapina specimens, the Cro-Magnon skulls are dolichocephalic, the index, according to Topinard (*La Anthropologie*, 1876, p. 465), averaging 73.22. In the "Vieillard" with a total breadth of 154 mm. (cast), the index is 74.7, and the Cro-Magnon II (also cast) the breadth is 155 and the index is 76.1.

Since the discovery of the first four skeletons in the *abri* of Cro-Magnon, a number of others with the same characteristics and from the same period have been found in the vicinity; one in the *abri* of Laugerie-basse in 1872, one in the *abri* of Raymonden at Chaneelade in 1888, in the grotto of Duruthy at Sores (Dept. Landes) in 1872-73, and in the grotto of Hoteaux at Rossilon (Dept. Ain). In several cases the occurrence of perforated shells and mammal teeth in close association with the bones suggests the bodily adornment, in true primitive style, with necklaces, bracelets, and girdles formed of



Fig. 101.—Cro-Magnon type of skeleton from Baussé-Roussé, near Monaco. (After Verneau, in *L'Anthropologie*.)

these objects; and there are occasional indications of special treatment of the body, such as the tying of the limbs together to form a compact package, or the dismemberment of the body and a rearrangement of the parts.

The same, or a closely related, race of men is found in the grottoes of Grimaldi, in the principality of Monaco on the Riviera where, since 1872, no less than fourteen skeletons of the Cro-Magnon type have been unearthed. These also quite usually appear adorned with various ornamental shells and teeth, which often occur by hundreds, and there appears about the bones a profusion of red ochre, evidently used to paint either the

bones or the bodies. The first skeleton found in this region occurred in the grotto of Cavillon, and was discovered by Riviere in 1872. It acquired at the time considerable fame under the name of "Man of Mentone." In this and the year following the same investigator found in the grotto of Baousso da Torre three more adult skeletons, one of which, profusely decorated with shells, possessed a stature of fully two meters; in 1874 this was followed by the discovery of the skeletons of two children, of four and six years, in the Grotte des Enfants. Julien, who next investigated the grottoes, in 1844, found a skeleton in the Grotte de la Barma Grande, with the head encased in red oehre, and in the same cave four more were discovered by Abbo, in 1892 and 1894. In 1901 further excavations were carried on in the Grotte des Enfants by Albert, Prince of Monaco, who found, not only two more skeletons of the Cro-Magnon type, but in addition a double grave, containing the bones of an old woman and a youth of a totally distinct race, with many negroid characters. This race of *Homo sapiens* has been named the "Grimaldi race," after the family name of the Prince who made the discovery; the name also being that of the region in which the grottoes occur. These negroid skeletons, although distinct in race, were evidently of the same culture status as their Cro-Magnon associates, for they also were adorned with a profusion of perforated shells. About the head of the youth was a crown of four rows of *Nassa* shells, and two bracelets of the same were about the left arm of the woman. As in the case of the skeleton of Chaneelade, the closely approximate position of certain of the limb bones suggested a post-mortem ligation of the parts, and the skeletons were somewhat folded so as to present

an appearance closely resembling that sometimes found among the American aborigines.¹ (§69 above.)

The discovery of so many skeletons of modern type, decorated and painted, in a deposit of not later than the Magdalenian, and in the midst of the Quaternary,



Fig. 102.—Double grave, containing a young man and an old woman, from Baussé-Roussé, near Monaco. These skeletons show negroid characteristics, and are racially distinct from the Cro-Magnon skeletons associated with them. Upon these, as thus far the only representatives, is founded the so-called Grimaldi Race, from the family name of the Prince of Monaco, on whose territory and under whose leadership the find was made. (After Verneau, in *L'Anthropologie*.)

¹ Cf. Verneau, *L'Anthropol.*, 1902, p. 587. Fig. 2, with Wilder, *Amer. Anthropologist*, VII, 1905, pp. 297-288, Pl. XXIII, 1.

has naturally awakened the suspicion that the burials were intrusions, and were themselves of Neolithic age or later. This view was held, for example, by no less an authority than G. de Mortillet in France, and by Castelfranco and Pigorini in Italy; but the most recent excavations, those of the Prince of Monaco, which were conducted with much care and thoroughness, and designed in part to settle this very point, prove beyond all doubt that the skeletons and the deposit were contemporaneous.¹ Verneau says:

“A l’heure actuelle aucune hésitation n’est permise; il est amplement démontré par les résultats des fouilles pratiquées dans la Grotte des Enfants, que les Troglo-dytes des Baoussé-Roussé enterrainent leurs morts à l’époque quaternaire. Les recherches méthodiques exécutées avec un soin méticuleux dans cette grotte ont levé les derniers doutes.”²

During the summer of 1909 an extremely well-preserved skeleton, nearly complete, was found in a deposit of undoubted lower Aurignacian age, associated with artifacts characteristic of the period. The site was the rockshelter (*abri*) of Combe-Capelle, in Montferrand, Perigord, and the discovery was made by Otto Haussler, the same anthropologist who discovered the Mousterian

¹ These excavations were under the immediate charge of the Abbé de Villeneuve, assisted by M. Lorenzi, and the results were substantiated by MM. Boule, Cartailhas and Capitan. The decisions against the Quaternary date of the remains had been based upon insufficient data, and had been made previous to these last ones.

² *Loc. cit.*, 1902; quoted by Déchelette, *Manuel d’Archéologie*, I, 1908, pp. 290-291. This work also contains a clear review of all the skeletons obtained from the site in question up to the date of publication.

skeleton three years before. As in the other case he associated with him in the actual excavation Professor Klaatsch, and thus the results, both in actual remains, and in observation of the position and the associated objects, leave nothing to wish for. The skeleton, now in the Museum at Berlin, is nearly complete, but with a few injuries to the separate bones.¹

Although at first considered to be a distinct species of the genus *Homo*, and named *Homo aurignacensis*, the Combe-Capelle skeleton is plainly no more than a variety of *H. sapiens*, although perhaps with close affinity to the Cro-Magnon race. The stature, however, is short (1600 mm.-5 ft. 3 in.), and the skull is very dolichocephalic (cranial index 65.75). It is this latter character which has led to suppositions of a possible affinity with certain other very long-headed skulls, such as the Brünn II (cran. index 68.1) and the Brüx (cran. index 69 approx.) attributed to the Solutrean, and considered below. At the present the exact position of the Combe-Capelle skeleton is doubtful, and there are professional supporters for each of the four possible views: (1) that it is a late Cro-Magnon; (2) that it belongs with the Brünn II group; (3) that it is a form intermediate between the two; and (4) that it is a distinct variety, i.e., *Homo sapiens, var. aurignacensis*. The extreme view, held by its discoverers, that it is a distinct new species, *Homo aurignacensis*, is not likely.

84. *Paleolithic Human Remains of Doubtful Position, but Representing the Modern Species, Homo*

¹ For the skeleton of Combe-Capelle, cf. the account of the original discovery by Klaatsch, in *Prähist. Zeitschr.*, I, 1910, pp. 273-338, and in *Zeitschr. f. Ethnol.*, 1910, pp. 513-577.

sapiens.¹—A number of undoubtedly ancient crania, found in various parts of Europe, mostly before the methods of investigation and comparison had progressed sufficiently to estimate their value rightly, have been studied from time to time, often with some attempt to associate them in groups, or otherwise show their affinities. Naturally these alliances, based upon insufficient data, are frequently found to be artificial, and the whole subject has needed the maturer judgment of these later years. Within the last decade this more critical examination of these older specimens has been made, and has resulted in placing the subject upon a sounder basis.

Preëminent in this work has been the Strassburg anthropologist, the late Professor Schwalbe, but numerous others, among whom may be especially mentioned Klaatsch, Gorjanovic-Kramberger, and Obermaier, have contributed noteworthy results in this field.

As one of the first results of this modern criticism the "Galley-Hill group" of MacNamara, consisting of the two skulls, Gibraltar and Galley Hill, has been broken up, and its members disassociated; the Gibraltar skull referred to *Homo neandertalensis*, as treated above, and the Galley Hill specimen united with *Homo sapiens*, as an extremely primitive type of that species, associated with the skull from Brüx. For these two types, Galley Hill and Brüx, distinctly lower than any other known

¹ For general works on these and other ancient skulls, cf. the following: G. and A. de Mortillet, "La Préhistoire," 3rd ed., Paris, 1900, pp. 251-260 and 291-302; H. Obermaier, "Les restes humaines quaternaires dans Europe centrale," Part I, *L'Anthropologie*, 1905, pp. 385-410, and Part II, *L'Anthropologie*, 1906, pp. 55-80; E. Fischer, *Article*, "Fossile Hominiden," in "Handwörterbuch der Naturwissenschaften"; Fischer, Jena, 1813.

specimens of *Homo sapiens*, Wilser and Gorjanovic-Kramberger propose the name *Homo fossilis*, a variety, or perhaps a species, intermediate between the two species *neandertalensis* and *sapiens*, but nearer the latter. This proposal is a convenient one and serves to isolate this primitive group from the rest, a position borne out by careful measurements; yet a few other skulls, like the one from Combe-Capelle, are not far removed and serve perhaps to link this group to that of Cro-Magnon, thus denying it a sufficient degree of isolation to be considered a separate species.

The Galley Hill cranium was found in 1888 by Elliot, an amateur collector, at the place of that name, three quarters of a mile northwest of the town of Northfleet, Kent. The specimen included originally the entire skeleton, but unfortunately the bones, which were very soft, were first found by a workman, and neither he nor Mr. Elliott were very successful in removing them. Thus the portions recovered were fragmentary and included, besides a skull with the facial bones wanting, the right half of the jaw, the femora, tibiae, the clavicle and humerus of one side, and fragments of the pelvis and sacrum.

These bones were first subjected to a scientific investigation in 1895 by Newton,¹ but his paper was a short one, and there is great need of a more complete study of this interesting form. In features this skull, like all the early specimen of *H. sapiens*, is extremely long and narrow, having a maximum length of 205 mm. and a breadth

¹ E. T. Newton, "On a Human Skull and Limb-bones found in the Paleolithic Terrace Gravel at Galley Hill, Kent." *Quart. Journ. Geol. Soc.*, August, 1895, pp. 505-527 (1 plate).

of but 132, which give a cranial index of 64.4. The cranial dome is low, and the forehead somewhat retreating. There are conspicuous superciliary ridges, but they contain only the superciliary elements of Schwalbe, and not the supra-orbital ones lateral to these, and are thus not comparable to the *tori* of the species *neandertalensis*. The face is not markedly prognathous, and the chin possesses a good mental prominence.

The same general characteristics are met with in the cranium from Brüx in Bohemia, recently described in detail by Schwalbe.¹ This skull was found in the suburbs of the town of Brüx in Bohemia, forty miles northwest of Prague, and near the German border. It was excavated on Dec. 12, 1871, and came into the possession of Dr. V. Fric, the proprietor of the well-known Natural Science establishment. At the site of discovery the surface loam has a depth of two feet, followed immediately beneath by a deposit of good building sand. At the depth of six inches within this latter, or two and one half feet beneath the surface, there was found a typical Neolithic axe, of the type known as a *casse-tete*, and some two feet beneath this lay the skeleton.

The circumstances of this find are thus in no way positive, and have led to no definite conclusion concerning age. The sand layer is generally considered Quaternary, but Woldrich believes it to be more modern, yet concedes that the skeleton and the axe were associated

¹ G. Schwalbe, "Das Schadelfragment von Brüx und verwandte Schadelformen." Article II in the "Studien zur Vorgeschichte des Menschen," published as a "Sonderheft" to the *Zeitscher. fur Morphol. und Anthropol.*, pp. 81-182, 3 plates and 31 text figs. (For the Gibraltar skull, cf. especially pp. 154-160.)

accidentally and have nothing to do with each other. It is thus necessary to rely wholly upon the physical characters of the skull itself, which shows a close resemblance

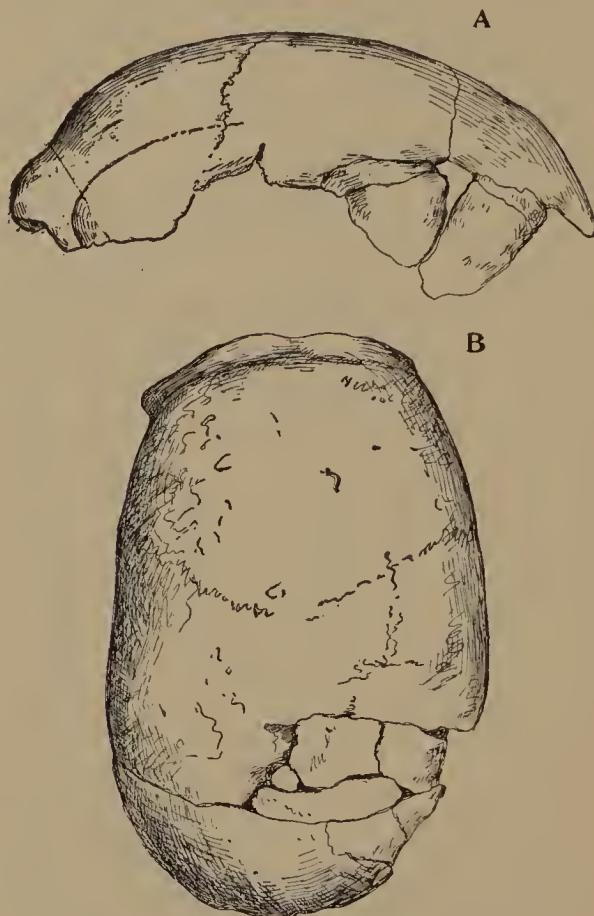


Fig. 103.—Two views of the skull-fragment from Brux in Bohemia. (After Schwalbe.)

to that from Galley Hill, although the cranium is smaller. Schwalbe estimates the maximum length, if the skull were complete, at 190-195 mm. and the maximum breadth

at 130-135, giving a cranial index of approximately 69. The cranial dome as shown in profile is low, at about the lowest limit for the recent species. As in the Galley Hill skull, the superciliary ridges are heavy and somewhat projecting, but they consist of the medial or superciliary element only (medial to the supra-orbital foramen) and are thus simply an exaggeration of what are found in modern male skulls, and are not the supra-orbital tori of the Neandertal species, which possess also a large lateral element, and extend entirely across the brows.

A third skull, belonging with the two last is that known as "Brünn II" and found by Makowsky at Brünn in Moravia, in 1891.¹ It was found during the excavation for a building, and was badly injured during removal, an unlucky step on the part of a workman utterly destroying the jaw and a large part of the face. The site was evidently an interment, and, as in the Cro-Magnon graves, there were found a quantity of shells used for decoration, in this case over six hundred *Dentalium* shells. There were also other associated objects

¹ Six years before this the same investigator had found and exploited another supposedly ancient skull, which is known as "Brünn I," and is liable to be confused with the one of 1891, especially as casts of both of them are furnished by Dr. Kranz of Bonn, and are often found in collections in association. No. I was found on the "Roter Berg," near the city, and No. II in the city itself, on Max-Joseph Strasse, but it happened that No. II lay in red earth, and is stained a deep red color, while No. I, although found on the Roter Berg, is not red, but ochre yellow. As these colors are reproduced in the casts, this circumstance is likely to add to the confusion. As it has proved, Brünn I is quite modern in type, and perhaps in date, being not earlier than Neolithic, while Brünn II, considered here, is definitely Quarternary in date, and of an extremely low and distinctive type of *Homo sapiens*.

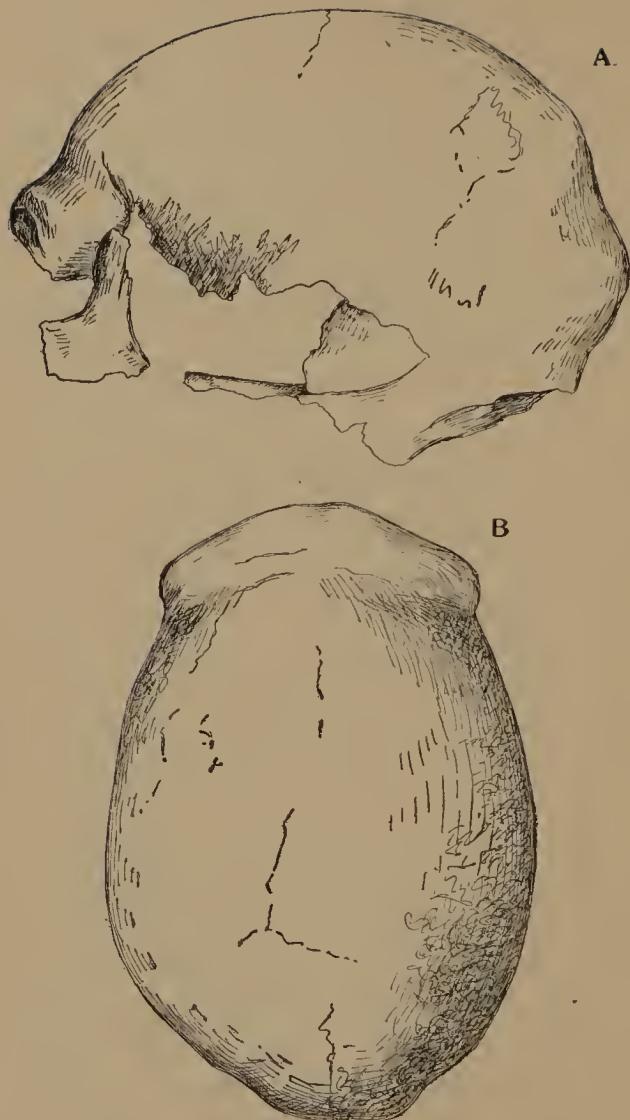


Fig. 104.—Two views of the skull-fragment from Brunn in Moravia. This is the one from Max-Joseph Strasse within the city, and often designated as Brunn II. Another skull, found on the Roter Berg outside the city, and known as Brunn I, is probably quite modern (Neolithic). (After Makowsky.)

of interest, such as small perforated disks of bone and ivory, and a little human effigy of mammoth ivory, thought by experts to have been cut out while the ivory was still in a fresh state. This statuette was in two pieces, with several parts lacking, and showed little artistic skill. The skull is a large one, with a length of 204 mm.; yet with a breadth of only 139 mm., it is very dolichocephalic, and shows a cranial index of only 68.2. The cranial vault profile is, however, higher than in the skull of Brüx, and compares well with the Cro-Magnon average.¹

The Egisheim cranium, which lacks face and jaw, and is otherwise very fragmentary, is yet of much importance. It was found in 1865 by Faudet at Egisheim, near Colmar in Alsace, and, like the foregoing, occurred in the loess, associated with the bones of Quaternary animals. In spite of its great age, however, it is definitely of the species *sapiens*, and belongs somewhere near the Cro-Magnon race, perhaps, as suggested by Klaatsch, a transition to the modern type. With a length of 197 mm. and a breadth of 150, which gives a moderately dolichocephalic index of 76.1, the skull is removed from the Galley Hill-Brüx-Brünn group, and comes nearer the Cro-Magnons.²

85. *Late Paleolithic Interments; the First Brachycephals.*—The first skulls of the brachycephalic, or broad-

¹ A. Makowsky, "Der diluviale Mensch in Löss von Brünn." *Mitt. anthrop. Ges. Wien.*, 1892, pp. 73-84 (3 plates). M. Kriz, "Beiträge zur Kenntniss der Quartärzeit in Mähren." *Steinitz*, 1903, pp. 560 (180 figs.).

² G. Schwalbe, "Ueber die Schädel-formen der ältesten Menschenrassen mit besonderen Berücksichtigung des Schädel's von Egisheim." *Mitteilungen d' naturhist. Gesellsch.*, in Colmar, 17 Stn., 1897.

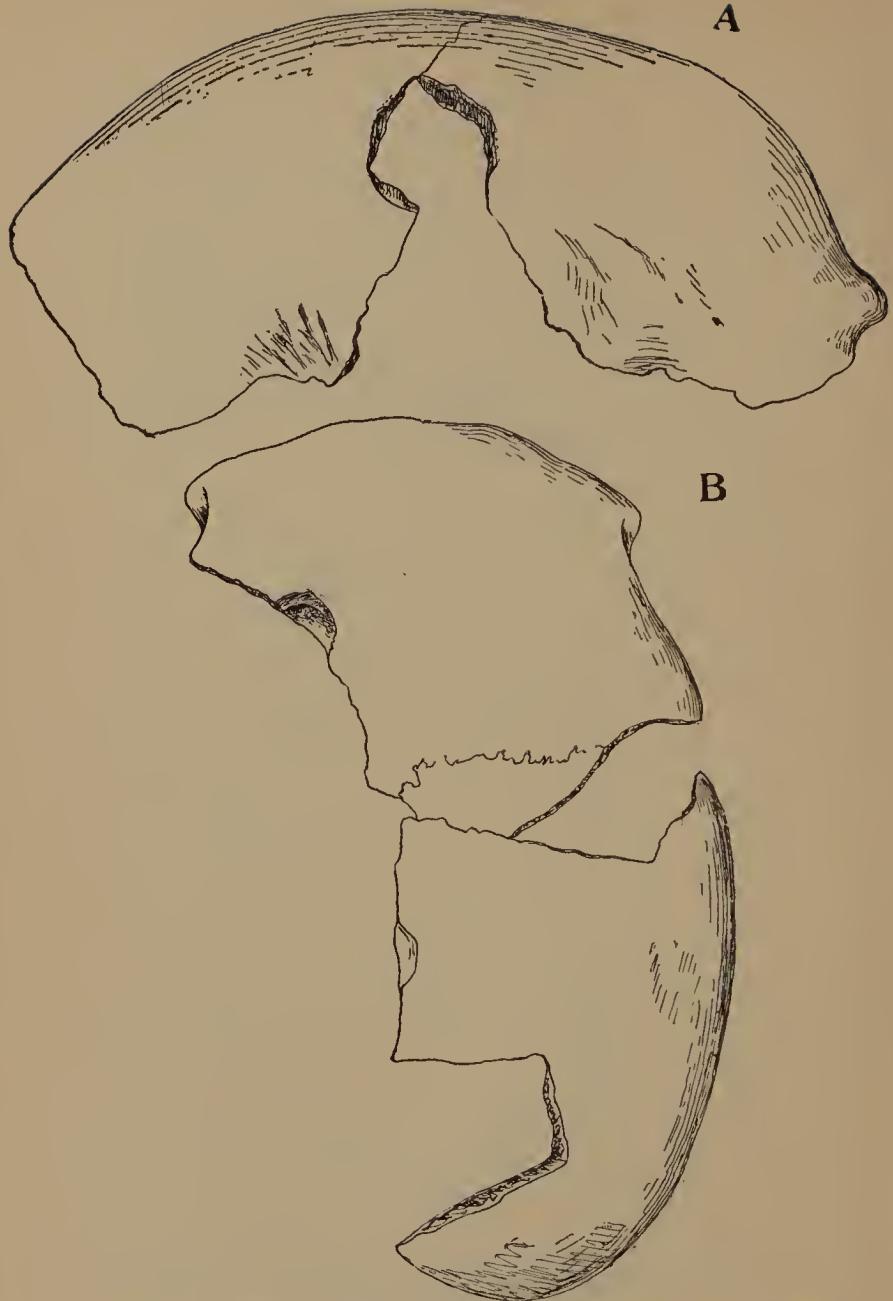


Fig. 105.—Two views of the skull-fragment from Egisheim, near Colmar.
(From Schwalbe, after Faudel.)

headed, type date from the Azilian Tardenoisian Period of the Late Paleolithic, and have thus far been obtained from three localities: the grotto of Furfooz, in Belgium; at Grenelle, near Paris; and the grotto at Ofnet, west of Munich. The first of these was a grotto used for interment, and contained the skeletons of sixteen individuals, the mouth being closed by a great stone block. Discovered by Dupont in 1866, too early for careful study of the site, only two of the skulls were sufficiently well preserved for observation, but these were seen at the time to be brachycephalic, and as such excited quite a little interest at the time. Upon these Quatrefages and Hamy founded their "Brachycephalic Furfooz race," a name which may be convenient to retain for all remains of this type.¹

The Grenelle remains consist of a single skull, excavated in 1870, with unfortunately too little data to be sure of its period. It is definitely brachycephalic, but is probably Neolithic.

The burial at Ofnet was found in the larger of the two grottoes at this place, and is in the method of interment employed absolutely unique. The deposits on the floor of this grotto consist in order, from the bottom up, of Aurignacian, early Solutrean, late Magdalenian, Azilian-Tardenoisian, Upper Neolithic, Hallstatt-La Tène, and medieval, with characteristic artifacts in each, and in

¹ For the Furfooz interment, cf. E. Dupont, "Etudes sur les feuilles scientifiques exécutées pendant l'hiver de 1865-1866 dans les caverns des bords de la Lesse." Bull. Acad. R. de Belgique, Ser. 2, T. 22, pp. 31-54. The skull nests at Ofnet are described and pictured by Schlitz, in Part III of a large work written by R. R. Schmidt and others, with the title, "Die diluviale Vorzeit Deutschlands," Stuttgart, 1912.

the Azilian-Tardenoisian layer were found two masses, or "nests," of human skulls, disposed in a single layer, and facing uniformly west. In the larger nest there were no less than twenty-seven such skulls, and in the other, distant from the first only about three feet, were six more. With nearly all of them were associated numerous beautifully worked Azilian flints, and they were decorated with ornaments made of stag horn and



FIG. 106.—The two nests of skulls found at Ofnet, near Munich. These consist of remains of men, women, and children, mainly the two latter, and the heads with part of the necks attached had been cut off, either when the victims were still alive or soon after death. Both dolichocephalic and brachycephals are the earliest known skull of this type. In age these deposits are determined to be Azilian-Tardenoisian. (After R. R. Schmidt.)

sea shells. All lay embedded in ochre, used probably as paint, and, as the central ones were more crushed than the outer ones, it may be deduced that the skulls were not placed there simultaneously, but were added singly, or a few at a time. The majority of the skulls were those of women and children, but there were four adult males.

Naturally a matter of immediate interest is that of a possible explanation of this singular mode of interment,

but as yet there is no very satisfactory one. The heads had evidently been placed there when fresh, and had been cut off from the bodies with heavy knives of flint, for the jaws and neck vertebræ were still in association with the skulls, and upon the latter were numerous deep gashes which could only have been thus inflicted. The prevalence of children suggests cannibalism, yet in that case the heads would have formed a part of the feast, and they would hardly have been laid away in ochre, and with the valuable associated objects. The other most natural suggestion is that of a ritualistic sacrifice, yet the indications are too few to raise this above the rank of a guess.

What is of especial interest to the anthropologist is the fact that in these nests is found a mixture of both long and short-headed skulls, together with others that are hybrids between the two. The short-heads correspond well with those of Furfooz, and undoubtedly belong to the same race, but the long-heads are in general shape unlike the earlier long-heads of Brünn and Brüx, and must be considered as new importations, like the others. One of the eight short-headed skulls has a cranial index of 83.33, while the best preserved long-headed skulls shows one of 70.5. Some have seen in these earliest European Brachycephals the advent of the Alpine race of later times, and in the same way the long-heads may be Mediterraneans; but we know at present too little of the intermediate history to draw safely such fundamental conclusions. As in so many other cases, it is better to consider the Ofnet burials as furnishing data of the utmost importance, without attempting as yet to relate them too definitely to other facts.

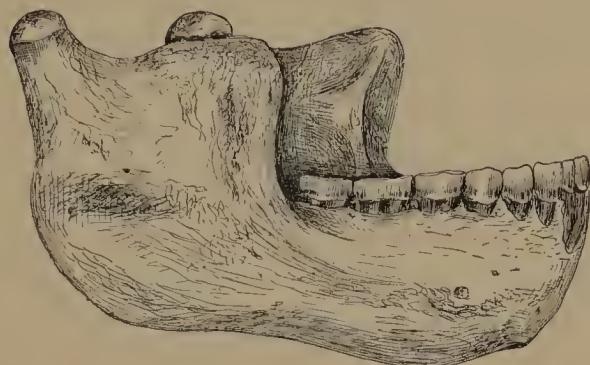
86. *Early European Ape-Men; Homo heidelbergensis and Eoanthropus dawsoni.*—Placing the advent of the present human species in Europe within the Aurignacian period, and associating his immediate predecessor, *Homo neandertalensis*, with the Mousterian, we have a vast period of time earlier than this during which activities quite beyond the power of any known ape constantly manifested themselves. Someone was responsible for the hand axes of the Acheulian, and someone had learned to make a straight cutting edge for them which in the previous period he could not do. Someone still earlier, at Strépy and perhaps at Mesvin, busied himself with flint tools, and made the initial experiments in shaping them into better and more convenient forms; and if we can believe the imperfect evidences, someone still earlier, even back in the Pliocene, held channe pieces of flint in hands much like ours, and used them for various simple mechanical purposes.

But what was the appearance of the being or succession of beings whose activities are thus expressed? In what bodily shape was housed the restless spirit that experienced successively the tropical warmth and the first glaciations, whose descendants developed into the man of Neandertal, and whose roots went deep into the line of Simians? Has a single scrap of bone or tooth, imbedded in glacial drift or wind-blown sand, come down to us to afford a single glimpse of such transition beings?

At the present writing European prehistorians are able to present remains of two such specimens in that continent, not precisely dated, but of early Quaternary origin, the Heidelberg jaw and the Piltdown cranium.

The first of these was discovered October 21, 1907, by Dr. Otto Schoetensack of Heidelberg, in a gravel pit in the village of Mauer, about ten kilometers south of his

a



b

Fig. 107.—The mandible found at Mauer, 15 kilometers south of Heidelberg in 1907, and the type and only known fragment of the species *Homo heidelbergensis*. (After Schoetensack.)

place of residence.¹ This pit has long been used as a source of building sand, and has yielded from time to time during many years occasional bones and teeth of early Quaternary mammals, and, because of this, has long been under the surveillance of the university authorities. In this they have been ably seconded by the Director of the pit, Herr Rosch, who, at the time of this important discovery, had been on the watch for some thirty years, and had carefully made over to Dr. Schoetensack every bone fragment that came to light.

The entire deposit in this pit is fully twenty-five meters thick, and belongs to the early Quaternary, as may be seen by the occurrence of the bones of the *Elephas antiquus* instead of *Elephas primigenius*, of *Rhinoceros etruscus*, and not *R. tichorhinus*, and the absence of the cave hyena; and here, almost at the bottom of the stratified and undisturbed deposit, 24.63 meters beneath the surface, was found the jaw in question. It was broken in two pieces by the blow of the spade which revealed it, but the specimen was fortunately so perfectly preserved that there was no splintering and the two pieces were easily fastened together exactly. Furthermore, a small oval pebble had become firmly cemented to the teeth of the left side by lime, and in its removal the crowns of four teeth, two premolars and the two first molars, were taken off, but the teeth of the opposite side are complete and perfect, as indeed is the entire dentition otherwise, which represents that of an adult in full vigor, without a break or sign of

¹ Otto Schoetensack, "Der Unterkiefer des *Homo heidelbergensis* aus den Sanden von Mauer bei Heidelberg," Engelmann, Leipzig, 1908, 67 pp. and 13 plates.

caries, and with the chewing surfaces only slightly worn down.

Viewed as a whole, the jaw is extremely heavy and massive; the teeth are wholly of the human type, without excessive emphasis on the canine, or suggestion of diastema, but the jaw itself is strongly simian. If, however, we compare it carefully with the jaw of Spy I, or jaws of the heavy type from Krapina (var. *spyensis*) we find them all somewhat similar, save that the jaw from Heidelberg is thicker and more massive. One of the most strikingly simian features of the Heidelberg jaw is the ramus, which is so broad and at the same time so short, that the outer surface presents almost a square surface for the insertion of the masseter, quite as in the anthropoid apes, *e.g.*, the gibbon. Now neither the jaw of Spy I, nor the specimens of the Spy type from Krapina, possess anything more than fragments of the ramus, but in the skeleton from La Chapelle-aux-Saints, although a little senile and nearly toothless, the jaw is practically complete. When restored in a few places, and with the shrunken alveoli built out and equipped with teeth, M. Boule asserts that it bears an extraordinary resemblance to the jaw from Heidelberg; and, still more important he fits the cast of the latter to the skull from La Chapelle-aux-Saints, and finds that it fits almost as well as does the jaw that belongs with it, harmonizing fairly well in outline and in general contours. (Cf. Fig. 100.)

It thus seems likely that the jaw "from the sands of Mauer," in spite of its strikingly simian features, was, after all, in its general appearance not so very much below that of *Homo neandertalensis*, but that, when

studied in detail, every character that differed at all differed in the direction downward, or toward the simians. Thus, in the thickness through the body of the jaw, those of Spy I and Heidelberg measure respectively; at the mental foramen, 13.5 and 18.5; across the third molar, 16 and 23.5; and at the symphysis, 15 and 17.5. The width at the symphysis (symphysial height) is hard to ascertain in the Heidelberg specimen, because of the loss of the alveolar processes upon the outer side, a condition which exposes the roots of the incisor teeth, but the indications are that in this measurement the two jaws are the same, 34.5 or 35. That, however, the body of the jaw is higher in the Heidelberg specimen further back is shown by a comparison of the measure taken beneath the middle of the second molar teeth, 28.5 in Spy I, and 31.8 in the Heidelberg.

In the ramus, which is so broad and short as to suggest strongly an ape, the least breadth, taken where the margins curve in a little, is 51.5 mm. while in recent men this measurement is seldom above 35.

Summarizing the evidence thus far concerning the jaw "from the sands of Mauer" we may acknowledge with Schoetensack that it is "pre-neandertaloid," and represents a stage previous to that shown in *Homo neandertalensis*. Although difficult to date, it seems by the associated animals to belong somewhere in the Second Interglacial Period, that of the Mindel-Riss, and thus antedates the Neandertal men by perhaps two hundred thousand years. Judging by its characteristics it was probably the direct ancestor of the latter, and thus represents an earlier stage of the race which culminated in the Mousterian, and then died out, or was exterminated,

leaving no descendants. The physical differences are great enough to place it as an independent species of the same genus, and it has thus taken its place among the other "men" as *Homo heidelbergensis*.

The other early Quaternary specimen is the "Piltdown skull," found in 1911, but first announced officially in March, 1913, with the publication of a carefully written description of the site.¹

About ten years previous to this date Mr. Charles Dawson noticed some flints in the country road near Piltdown Common, Fletching, Sussex (England) and ascertained that the material forming the surface in this spot came from a near-by gravel bed, from which it had been taken to mend the road. He then consulted the workmen employed at the gravel bed, and made an arrangement something like that of Dr. Schoentensaek with the officials at Mauer, by which the men were to save for him any bone fragments found there. Some days after this a workman handed him a piece of a very thick parietal bone, which he kept, but delayed publishing until he found more. In 1911, some years after this first discovery, he himself found in the pit a fragment of a frontal bone, also thick, which he took to his colleague, Professor Arthur Smith Woodward. After this both men made a more careful study of the pit, and col-

¹ Chas. Dawson and A. S. Woodward, "On the discovery of a paleolithic human skull and mandible in a flint-bearing gravel overlying the Wealden (Hastings beds), at Piltdown, Fletching (Sussex)." *Quart. Journ. Geol. Soc.*, Vol. 69, No. 273, March, 1913, pp. 117-151. (This number contains three papers on this subject, by Dawson, Woodward, and G. Elliott Smith. Cf, also reviews of the find in *Science*, Nov. 7, 1913, pp. 663-664, and by MacCurdy, in *Amer. Anthropol.*, Vol. 15, 1913, pp. 248-256.)

lected several more pieces, presumably of the same skull and also a very primitive jaw, all of which had evidently been carelessly thrown aside by the workmen. They obtained also bones of a Pliocene elephant, and flint artifacts of both Chellean and pre-Chellean types, also eoliths. These numerous objects were plainly of a different original date, and had been collected in the glacial drift by the not too gentle force of ice. Thus the bones "cannot be safely described as being of earlier date than the first half of the Pleistocene (Quaternary) Epoch. The individual probably lived during a warm cycle in that age."¹

The skull is a little surprising in not being strikingly different in form from that of the recent species. The bones are, however, unusually thick and heavy, and the brain cast, made from the bones, is unmistakably very low and ape-like. Otherwise the general form is rounded, with a fairly high forehead, and without indication of the heavy supraorbital tori so marked a feature of *Homo neandertalensis*. The jaw, on the other hand, is unmistakably simian, much more so than the Heidelberg specimen; and it is for this reason that the investigators felt the necessity of placing the specimen in a new genus, to which they gave the name of *Eoanthropus*. For the specific name, Woodward selected the obvious *dawsoni*, in honor of the discoverer. In the paper cited the new genus is rather loosely defined "by its ape-like mandibular symphysis, parallel molar-premolar series, and narrow lower molars which do not decrease in size backwards; to which diagnostic characters

¹ Dawson, *loc. cit.*

ters may probably be added the steep frontal eminence and slight development of brow ridges."

On account of the undoubtedly simian character of the mandible, as compared with the almost modern form of the cranium, some anthropologists have felt from the first that the two parts do not belong together, a position that may easily be maintained from the confessedly non-contemporaneous character of the other objects found in the pit; and this feeling became stronger after the careful examination of the jaw and teeth by an American specialist on the primates, Dr. Gerritt S. Miller, who pronounced the jaw definitely that of a chimpanzee (genus, *Pan*). Of this he made a new species, *Pan vetus*, and by this claimed the presence of one of the large modern anthropoid apes in Quaternary England, hitherto unknown. To the jaw belongs also a canine tooth, found after the other pieces by the Rev. Fr. Teilhard, a friend of Dawson.

In spite of the lack of date for any of the fragments, and the known lack of contemporaneity in many of the pieces collected, the great thickness of the cranial pieces, and the primitive character of the brain, as indicated by them, show that we have here to do with a really new form, perhaps generally distinct from *Homo*, and more in line of ancestry with modern man than *Homo neandertalensis*, which is now generally felt to be, not a direct ancestor, but a side branch. *Homo heidelbergensis* comes into the Neandertal line, as its ancestor, but the entire line died out during the late Quaternary, and left no descendants. *Eoanthropus*, on the other hand, may easily have been somewhere in the direct line leading to the modern species, and

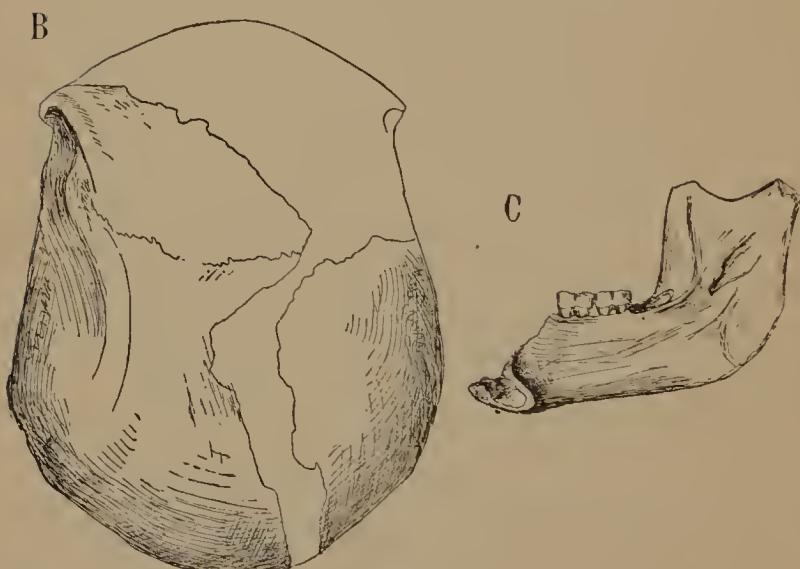


Fig. 108.—The Piltdown Skull, *Eoanthropus dawsoni*; from the gravel pit at Piltdown, in Sussex, England. A. The cranial fragment, with restoration of the missing parts, seen from the left. B. The same, from above. C. The mandibular half, from the inside, but without the missing tooth, which was found detached from the other piece. (After Smith-Woodward.)

may prove to be a species intermediate between the latter and the Javan semihuman-creature, *Pithecanthropus*, whose presence in Europe has never been indicated.

87. *The Javan Ape-Man Pithecanthropus Erectus.*—During the final decade of the last century, when the discoveries in the grotto of Spy were still very recent, and some years before the findings at Krapina, a startling discovery was made in a most unexpected part of the world, and one of a most unexpected nature. This was the unearthing in 1894, in the island of Java, of the skeleton of a being almost intermediate between man and the highest apes, closely corresponding to the "Missing Link" of a previous generation of speculators. Ernst Haeckel, in his philosophical writings, had already postulated such a creature, man-like but speechless, to which he had given the name, *Pithecanthropus alalus*, and his friend and admirer, Gabriel Max the artist, had painted a now famous picture of this hypothetical animal, and presented it to Haeckel upon the latter's sixtieth birthday. Speculation and painting were alike fictitious, but here, if not in the flesh, at least in the bones, discovered by Dr. Eugene Dubois, a Dutch medical missionary, was an actual being, no longer imaginary, but real. Naturally Dubois gave to it the name *Pithecanthropus*, but, as he could not deny it the power of some rudiments of speech, he chose for the specific name, instead of *alalus*, the speechless, the word *erectus*, the most prominent physical character of the new-found bones.

These bones consisted of a cranium, almost complete, an entire right femur, and two teeth, all quite detached from one another, yet resting at exactly the same level, and without much doubt the fragments of the same skele-

eton. In geological time the stratum in which they were found had long been considered late Pliocene, but a careful reëxamination of the spot made it a little later, possibly corresponding to the beginning of the Ice Age (Pleistocene) in the north.



Fig. 109.—Restoration of the skull of *Pithecanthropus erectus*, the ape-man from Java. (After Dubois.)

Immediately following this discovery there followed a heated discussion concerning the systematic position of this new creature. Some considered it definitely a man, but much lower than any hitherto known; others called it an ape, perhaps something like a gigantic gibbon; while there was not lacking a strong faction, who saw in *Pithecanthropus* a definite transition form, intermediate between the two.

The late Gustav Schwalbe of Strassburg, through his detailed study of the remains, became the leading sup-

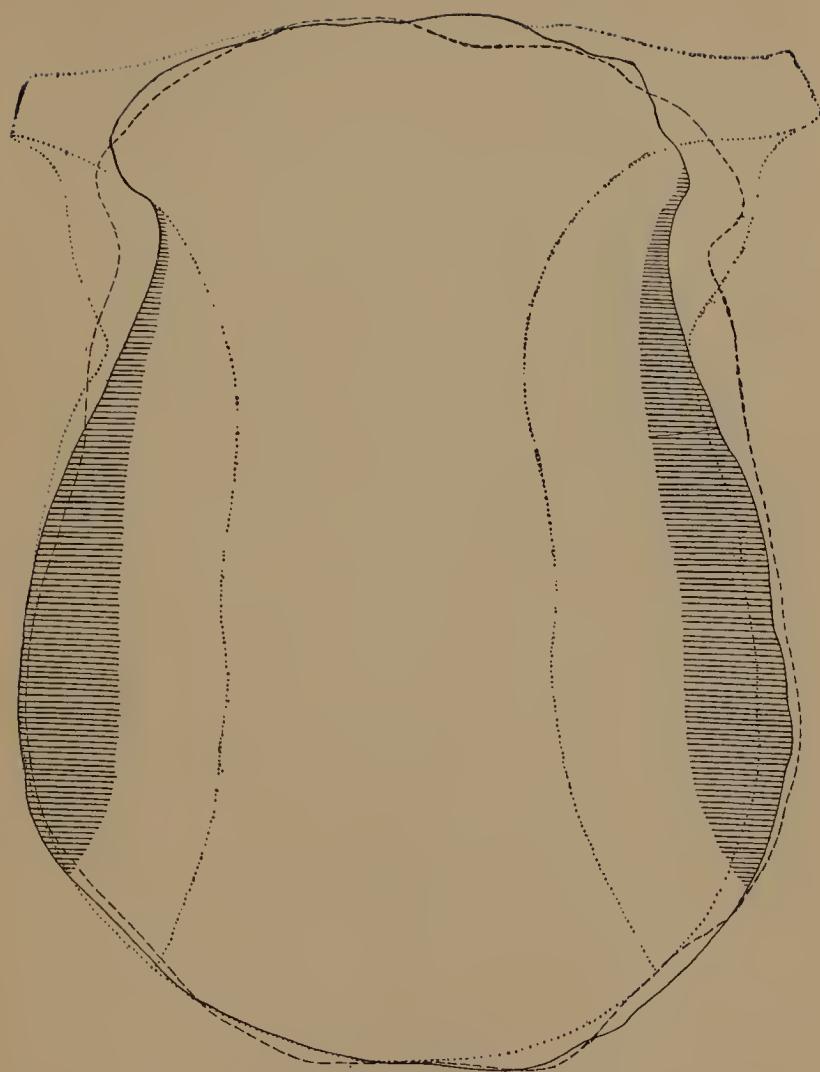


Fig. 110.—Cranium of Pithecanthropus, seen from above, and compared with the similar contours of (1) the Neandertal cranium, and (2) that of a gibbon, *Hylobates*. The gibbon outline is represented by dots; that of the Neandertal by dashes. (After Schwalbe.)

porter of this latter position, and considered *Pithecanthropus* as marking a stage in the direct ancestry of *Homo heidelbergensis* and *Homo neandertalensis*, and probably of modern man also. It was possible, from the skull fragment, to calculate approximately the cranial capacity, which was found out to be not far from 850 cc. That of our highest apes does not exceed 500 cc. while that of the lowest of the recent species gives a capacity of 1200-1300.

A result harmonious with the last attended the examination of the "calvarial height," that is, the height of the cranial roof, measured in a profile curve. Upon the nasion-inion line the greatest perpendicular was erected, and the length of this expressed in terms of the length line. In modern man this perpendicular averages a little more than one-half of the length line (52 per cent); in the Neandertal species 40 per cent, and in *Pithecanthropus* 34.2. It may also be noted that the length-breadth index of *Pithecanthropus* is 73.4, showing that the head is dolichocephalic, like the Neandertal species and all the early specimens of *H. sapiens*, while in all of our modern apes, without exception, the heads are brachycephalic. The study of the endocranial cast, taken from the skull fragment, showed a fairly well-developed third frontal convolution (the "speech center" of Broca), larger than in any of the higher apes, yet less than in the Neandertals, and suggesting the crude beginnings of an articulate speech. *Pithecanthropus*, then, was not *alalus*.

Naturally, the unearthing of remains so vital to human interest centered our attention upon eastern Asia, and before long a German expedition, equipped by Mme.

Selenka, the widow of Dr. Emil Selenka, the anthropologist, went to Java and made further detailed excavation of the site at Trinil. A single tooth only, a lower molar, rewarded their patience, but it probably belonged to the same individual, and gave further data concerning the proportions of the mandible.

During the present writing an extensive expedition, to last several years and include a large part of eastern Asia, made under the leadership of Dr. R. C. Andrews, and sent by the American Museum of Natural History of New York City, is well under way, and, although the objects in view include many interests, one of the chief is the search for further remains of the ancestors of man. It is to be hoped and expected that further important discoveries may be announced at any time.

88. *Hesperopithecus haroldcooki*.—A recent announcement, undoubtedly of the greatest significance in this connection, but far too fragmentary to give us much definite information. Mr. Harold Cook, living on a ranch in Sioux Co., Nebraska, wrote to Professor Henry Fairfield Osborn, on February 25, 1922, announcing the discovery of an ancient tooth of human appearance, a second molar, the upper left, in Pliocene strata there. The tooth was associated with remains of *Pliohippus*, and probably with *Pliauchenia*, the giant camel. It was found in the Snake Creek Beds.

The tooth was sent later to Professor Osborn, at the American Museum in New York, who named the species in honor of its discoverer, *Hesperanthropus haroldcooki*. Judging from the tooth alone, this species seems to have been about half-way between *Pithecanthropus* and the man of the present, and is assumed to represent a very

early migrant from Asia to the New World, having come by land route, which would have then been quite possible.¹

89. *Speculations Concerning the Pedigree of Modern Man.*—In the early days of the science, after the Neandertal man was accepted as a normal type, and not pathological, the natural tendency was to consider that he was the immediate ancestor of present-day man, and that he developed in place in Europe during the long time which separates the Mousterian period from the present. The discovery of the Cro-Magnon race, however, with its sudden appearance in Europe at a definite date, and the complete absence of all transition forms between it and the Neandertal type, emphasize the constant possibility of the introduction of new types by migration rather than by development, and the definite distinctness of the two species. For some time such early specimens as the skulls of Galley Hill and Brünn were looked upon as somewhat neandertaloid, and the skeleton of Combe-Capelle, when first found, aroused the hope anew that here at last was an intermediate type between the *neandertalensis* and modern man, but the later, more careful anatomical study of all the early fragments shows more and more plainly the complete distinctness of the two species. The line of the Neandertals came to an abrupt end at about the Aurignacian, and that of the modern type appeared equally suddenly under circumstance that necessitate the assumption of a migration.

¹This tooth was featured, with excellent illustrations, in the *Illustrated London News* for June 24, 1922, with an article by the distinguished English anthropologist, Dr. G. Elliott Smith.

The fact that the Neandertal type had no future, however, does not preclude interest in its past, which can be studied as in the case of any other extinct form; and here comes in the jaw from the sands of Mauer, near Heidelberg. Boule first pointed out that this jaw, ape-like as are its proportions, fits the skull from La Chapelle, a typical Neandertal man, surprisingly well, needing only a few minor changes in details; and this, although largely a coincidence, is yet suggestive, for the jaw and skull not only fit mechanically, but seem not inharmonious in form. (Cf. Fig. 100.) One gets the same result by comparing the jaws only, the one from Heidelberg with those of the Neandertal type: namely, that while the former is much more simian it is neanderloid, far more so than any jaw of modern form. From these and similar observations it is now generally felt that in the man of Heidelberg, present in Europe as early as the Mindel-Riss epoch, and differing from an ape mainly in his ability to use as tools the channe sticks and stones that came to his hand, we see the direct, immediate ancestor of the Neandertal type.

Properly speaking, we should now rest at this point and await further finds before continuing our speculation, but the point is one of such vital interest that, in the absence of actual data, we may be allowed to indulge in hypotheses while we wait. There comes first to our mind the possible relations of the Javan *Pithecanthropus*: whether it was the ancestor of the Heidelberg-Neandertal line only, or of the *Homo sapiens* line only, with several unknown intermediate links, or whether it may have been the common ancestor of both lines. The

discovery of the Piltdown fragments, suggesting a possible "*Eoanthropus*," gave a hint of a distinct line leading to modern man, either from *Pithecanthropus*, or from a more man-like form lower down, leaving *Pithecanthropus* out on the side.

For a time, especially in America, the determination of the Piltdown jaw by Miller as that of an ape threw *Eoanthropus* into disfavor, but with the English investigators there seems to be no doubt that both skull fragments and jaw were parts of the same individual. If this is the case, *Eoanthropus* is the most important fossil now in existence, showing that the line leading to the man of the present day early developed a high forehead and large brain, avoiding the line that lead through a low and slanting forehead, and heavy brows.

Perhaps, when a more complete skull is found of this species, it may suggest something definite of the line traversed by *Homo sapiens* in attaining his present condition, although both *Pithecanthropus* and *Homo heidelbergensis* fit in much better as ancestors of the Neandertal type, than as those of *sapiens*. It is by no means impossible to believe that *sapiens* has come directly from *neandertalensis* somewhere else, if not in Europe. Undoubtedly much of the last part of human development has taken place in Africa and Asia, and it may not be until we are well informed concerning the prehistoric deposits of these continents that we will be in possession of the essential data for explaining the human pedigree satisfactorily.

If, now, we assume that the Heidelberg man was a direct ancestor of the Neandertal, and that *Pithecanthropus* represents a still earlier stage along the same

line, the comparisons of proportions and the lines of contour are extremely reasonable and harmonious. Starting with Dubois' restoration of the skull of *Pithecanthropus* on the one hand, and the skull of La Chapelle-aux-Saints, as rejuvenated by MacGregor, on the

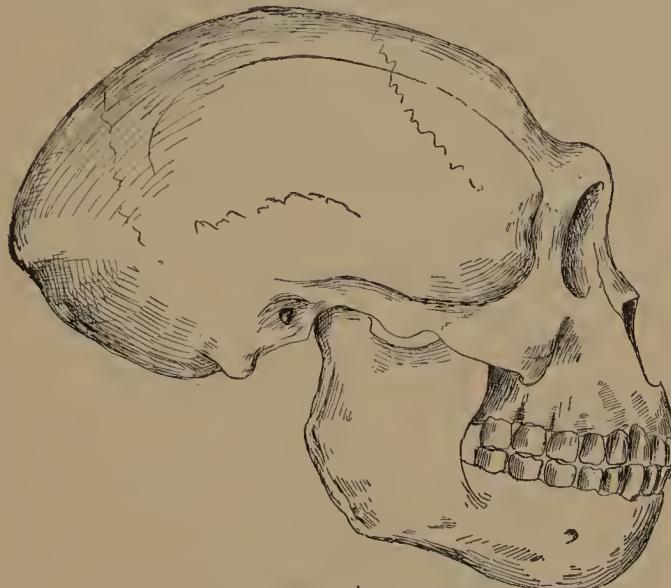


Fig. 111.—Hypothetical form, showing skull outlines intermediate between those of *Pithecanthropus*, as reconstructed by DuBois, and La Chapelle-aux-Saints, to which has been attached the jaw of *Homo heidelbergensis*. It represents a transition form, midway between the two.

other, an extremely plausible intermediate form may be made by the superposition of the two, drawn at the same size, and tracing lines half way between the two outlines, and to this hypothetical form may be given the jaw from Heidelberg, unchanged. (Fig. 111.) The result, as shown here, is a perfectly possible intermediate form, and furnishes this *Pithecanthropus - heidelbergensis, neandertalensis* line with so many steps that nothing is

wanting. Whether the outlines of the real *heidelbergensis* skull, when found, will resemble these, cannot now be known, but it cannot be far different.

The possible steps below *Pithecanthropus*, that is the comparisons between it and the apes, have already been a subject of much speculation, and it has to be acknowledged that while no one of the present genera is an immediate ancestor to this form, yet in all of them there are definite signs of close relationship. Viewed as candidates for the position of near ancestry, the orang-utan fails through his excessive prognathism and his short cranium. The gorilla, when adult, even in the female, masks what would be strongly similar outlines by its tendency to develop huge muscular ridges over the crest and across the occipital region; and the chimpanzee, in some respects the best candidate, has a rather weak jaw. The general appearance of the skulls of our modern anthropoids is that of several specializations, or variations, of a common ancestral type, which existed perhaps in the Miocene or earlier, and it would seem that in this, if it could be produced, we would find the immediate ancestor of *Pithecanthropus*.

If, now, we may accept the Neandertal man as an ancestor of the present type, developed elsewhere than in Europe, we have a single line of pedigree without gaps, and consistent in form and in the age of the separate members. The assumption of such a direct line accounts for all the facts yet known with the exception of the Piltdown fragments, which are at present in a much less certain position than they were thought to be some time ago. To accept these as a definite lower type in the direct line of human ancestry would remove from

this latter both the Neandertal and Heidelberg types, and probably *Pithecanthropus*, and would substitute for what we have in these an almost complete blank, with nothing but these fragments, without certain date, to fill it. Naturally, the data are still insufficient for any definite postulates concerning human ancestry, but at the moment the hypothesis presented here seems a very plausible one. Should the reader keep track of new discoveries in this field, and note the speculations and changes of opinion produced by each new find, he will find it a field of intense interest, well worthy of philosophical consideration.

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